

SYNTHESIS REPORT

CONTRIBUTIONS OF THE CLIMATE-RESILIENT CITIES IN LATIN AMERICA INITIATIVE





Fundación Futuro Latinoamericano (FFLA)
Climate Resilient Cities Initiative

Synthesis Report
Contributions of the Climate-Resilient Cities in Latin America Initiative

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Presentation

The accelerated process of urbanization at a global and regional scale, combined with the effects of climate change, generate complex challenges and important opportunities for cities. This is especially so for small and medium-sized cities, which show high vulnerability to climate change but which also yield great opportunities to achieve climate-resilient sustainable development. Latin America, as the most urbanized region in the world, must avail itself of concrete alternatives and develop its response capacity to these challenges.

The Initiative Ciudades Resilientes al Clima en América Latina (Climate Resilient Cities Initiative – CRC) was initiated and developed as part of a strategic alliance between the International Development Research Center (IDRC), the Climate Development Knowledge Network (CDKN) and the Fundación Futuro Latinoamericano (FFLA), seeking to create a bridge between research and concrete action.

The main objective of the initiative was to generate solutions that promote climate-resilient development in small and medium-sized cities in Latin America, many of which are experiencing rapid growth and climate change impacts, thereby contributing to improving the living conditions of the inhabitants.

During 2016, an international call was launched, out of which six projects were selected and implemented in thirteen cities in seven Latin American countries and which, with their various different perspectives and methodological approaches, generated responses and solutions to contribute to climate-resilient urban development, based on the active participation of the different local stakeholders. A gender perspective was also incorporated in the analysis.

This report shares the main findings, solutions and lessons learned from the process. We are very satisfied with the results achieved in the research-action projects because they provide a variety of responses to specific problems related to climate change in the cities and territories where they were implemented.

These solutions constitute contributions from the field, and involved the participation of academia and local stakeholders. They offer decision makers a range of options for enhancing climate-resilient urban planning, and also contribute to building knowledge on this issue within academia and across communities and practitioners working on urban and climate change issues.

We hope you enjoy reading this, but above all, we hope you value the contributions that local stakeholders in small and medium-sized cities can offer to solve concrete problems in the field, and also their contribution to compliance with international agendas to which different countries have committed.

Marianela Curi
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Introduction

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“Climate change is already affecting people, ecosystems and livelihoods in the world”, according to the latest report on the impacts of a 1.5°C increase in global warming by the Intergovernmental Panel on Climate Change (IPCC), launched in October 2018. The impacts of global warming are being experienced rapidly and unequivocally (sea level rise, loss of biodiversity, declining crop yields, more frequent heatwaves and heavy rains). The planet has already experienced a 1°C warming.

All countries are affected by this phenomenon, but the impacts tend to fall disproportionately on vulnerable population groups that, due to their conditions (socio-economic, health, education, age, gender, ethnicity, livelihood, location and housing characteristics, among others) are more exposed and more sensitive to its effects. Their ability to adapt is also more limited, as is the case for most people in Latin America and the Caribbean. According to CDKN's Executive Summary of the Fifth IPCC Assessment Report, the impacts of climate change in the region will mainly affect water availability, the spread of vector-borne diseases and food production and quality (CDKN, 2014).

As complex dynamic systems in permanent movement and change, cities have suffered an accelerated process of urbanization in recent years, seen especially in small and medium-sized cities. They have experienced great demographic growth, as many people have migrated from rural areas to urban areas, and, recently, migration from large cities to small and medium-sized cities has increased (CEPAL, 2018). In the last 30 years, medium-sized cities have grown faster than large cities, attracting most of the urban population.

Although there is no unified definition, the United Cities and Local Governments Network and UN-Habitat (2012) define thresholds of between 50 000 and 1 million inhabitants as characterizing small and medium-sized cities – also called intermediate or secondary cities.

However, beyond the size of their populations, these cities are defined by the relative size they have within their country, the system of cities in which they operate, and the similar functions they share in their country.

According to other information from UN-Habitat (2012), more than half the world's population (54%) currently live in urban areas. In the case of Latin America and the Caribbean, the urban population has reached 80%, and of this number, half are located in small and medium-sized cities. Additionally, projections show that this percentage will increase to approximately 90% by the year 2050.

This trend responds to the different characteristics of small and medium cities. These cities play an important connecting role between urban and rural areas, and have a relevant role in the provision of different types of services for the inhabitants of urban and rural areas; services such as commercial, educational, governmental, social, touristic, logistical and cultural, among others.

However, this accelerated urbanization, coupled with population growth, has become a strong driver of climate change in cities, making them highly vulnerable and exposed to its threats, due to various factors such as land use change, deforestation and their placement in high risk areas, among others. About 40% of the population of small and medium-sized cities lives in coastal areas, which exposes them to disasters (CGLU, 2016). Although the estimates are not exact, it is thought that cities also contribute 80% of greenhouse gas emissions in Latin America, coming mainly from the transport and electricity sectors (UN-Habitat, 2012).

Urban action therefore becomes an urgent and fundamental need for facing climate impacts with strategies of mitigation, adaptation and risk management, which will allow cities to prepare themselves and become more resilient.

Starting from the definition of resilience proposed by the IPCC (2014) as:

“ the ability of social, economic and environmental systems to cope with a dangerous event, trend or disturbance, responding or reorganizing in a way that maintains their essential function, their identity and structure, while preserving the capacity for adaptation, learning and transformation”,

we understand urban climate resilience in this document as the process through which, on the one hand, cities prepare themselves to face a climate phenomenon and, on the other hand, have the capacity to recover from events and disasters produced as a result of climate change. Climate resilience also includes the capacity to learn, to improve and transform.

In this context of challenges and opportunities, the Climate Resilient Cities Initiative was born with the aim of promoting climate-resilient urban development in thirteen small and medium-sized cities in seven Latin American countries¹. These cities, like many in the region, face common social, economic, environmental and climate-related challenges, including the following:

- **Significant levels of social inequality, a large number of informal settlements and high environmental degradation**, due to accelerated urbanization processes. Generally, the poorest people live in unsafe human settlements, on the banks of rivers, hillsides or neighborhoods with limited access to basic services and in situations of insecurity and violence.

¹ See Appendix: A matrix with general information on each project.

According to reports from 2016, the UN states that these great inequalities mean that climate threats have a disproportionate impact on poor and vulnerable groups, further increasing this inequality and poverty gap. In Latin America and the Caribbean, urban poverty levels reached 26.8% in 2016, while urban indigence reached 7.2% in the same year (CEPAL, 2018).

- **Weaknesses in their institutional decentralization, which, among other things, makes local governance difficult².** Although many cities have experienced interesting decentralization processes, these processes are still incipient in others. Resource transfer from the national government continues to limit the cities' capacity for action and causes problems in budget planning and execution, preventing, for example, the necessary financing to provide access to basic services for the entire population. (CGLU, 2016).
- As a consequence of the above, **many cities show deficiencies in the provision of basic services and infrastructure** (water, sanitation, electricity). According to UN Habitat data (2012), only 75% of homes are connected to the drinking water network in small and medium-sized cities in Latin America.
- **Weakness in their urban planning processes,** characterized by a short-term vision which meets urgent and non-strategic needs. Neither adaptation nor risk management are integrated into the local planning process, nor incorporated into their strategies or development plans. Urban development plans usually emphasize the physical aspect, instead of incorporating an integral and interdisciplinary perspective that considers the different dimensions of the urban space (social, political, cultural, economic, environmental and climate dimensions, among others) (CEPAL-IAI, 2013).
- Because of all of the above, **these cities are highly vulnerable to the effects of climate change** and are exposed and sensitive to suffering hydro-meteorological disasters, climate disasters and geological disasters. In general, and as previously stated, the most affected groups are those living in poverty. In the last 30 years, in Latin America and the Caribbean, around 160 million people have been affected by these disasters, and between 40% and 70% of economic losses have occurred in small and medium-sized cities, which are those that normally have weaknesses in disaster risk management (UN-Habitat, 2012).

In the specific case of the thirteen cities where the CRC Initiative was executed (Figure 1), their populations are exposed and sensitive to similar climate threats, such as problems directly related to water. All are exposed to flooding risk.

²According to UN Habitat (2016), an efficient urban governance system is the way in which institutions and citizens are organized and the processes they use to manage a city. These must be inclusive and integrated, which involves planning, budgeting, managing, and monitoring in a participatory manner, the provision of services in the city, as well as urban planning processes, including for climate resilience. In turn, for Fundación Futuro Latinoamericano, governance includes "those mechanisms, processes and institutions through which the State and civil society articulate their interests, exercise their powers, fulfill their obligations, have accountability, mediate their differences, and achieve balances in power asymmetries" (FFLA, 2015).



Project name	Short name	Cities and countries	Implementing partners
Climate-resilient Cumbaza: Towards water, energy and food security in rural-urban landscapes	Cumbaza Resiliente al Clima	Tarapoto (Perú)	<ul style="list-style-type: none"> • Global Canopy • Center for the Development and Research of the High Forest (CEDISA – Peru) • Center for Water Competencies (CCA– Peru)
A participatory decision-making approach to climate resilience and inclusive urban development in Latin America	Planeamiento participativo	Dosquebradas (Colombia), Santa Ana (El Salvador), Santo Tomé (Argentina)	<ul style="list-style-type: none"> • International Institute of Environment and Development – Latin America (IIED-al – Argentina) • Center for Urban Disaster Risk Reduction and Resilience (CUDRR+R) • Alterra (Stichting DLO)
Livelihoods and climate change: The effects of expansions-contractions and climate disturbances	Medios de vida y cambio climático	Cities of the Amazon Delta: Abaetetuba (Brazil); Ponta de Pedras (Brazil); Santana (Brazil); Mazagão (Brazil)	<ul style="list-style-type: none"> • Federal University of Pará (UFPA – Belém, Brazil) • Foundation for Support and Research Development (FADESP – Brazil) • University of Paraíba Valley (UNIVAP – São José dos Campos, Brazil) • International Research Institute for Climate and Society (IRI) • The Earth Institute (Columbia University, USA) • State University of Amapá (UEAP – Brazil) • State Government of Pará (Brazil)
Urban triangular cooperation: Building resilient development in the Triple Border of the Paraná Basin	Cooperación entre ciudades fronterizas	Foz de Iguaçu (Brasil), Puerto Iguazu (Argentina), Ciudad del Este (Paraguay)	<ul style="list-style-type: none"> • Leeds University • Polo Iguassu Institute (Brazil) • Directorate of Meteorology and Hydrology (Paraguay) • Catholic University of Our Lady of the Assumption (Paraguay) • National University of Asunción (Paraguay) • Faculty of Forestry Sciences, National University of Misiones (Argentina)

Amazon self-sustainable cities: Generating homes	CASA	Iquitos (Perú)	<ul style="list-style-type: none"> • Research Center of Architecture and the City (CIAC), Pontifical Catholic University of Peru (PUCP – Peru) • Institute of Nature, Territory and Renewable Energy Sciences (INTE), Pontifical Catholic University of Peru (PUCP – Peru) • Bartlett Development Planning Unit(DPU), University College London (UCL – England)
Climate-resilient Coyuca: Building gender-sensitive urban governance in the coastal lagoon system	Coyuca resiliente al clima	Coyuca de Benítez (México)	<ul style="list-style-type: none"> • Tecnosistemas y Peaje, S.A. de C.V. (Tecnopeaje) • Autonomous University of Guerrero (UAGRO – Mexico) • Consortium for the Study of Metropolitan Areas (CentroMet – Mexico) • University College London (UCL – England) • Acapulco Institute of Technology (Mexico) • PrabhakHosla Consulting • Indian Institute for Human Settlements

Table 1: Matrix of the CRC Projects (Source: Villamarin, G.)

According to the Fourth Global Report on Decentralization and Local Democracy: Co-Creating the Urban Future: The Agenda of Metropolises, Cities and Territories (CGLU, 2016), these challenges can be transformed into great opportunities to build resilience, since, due to their “proximity scale”, cities have favorable conditions that allow various local stakeholders to interact from their diverse spaces and work in a joint, coordinated, and close manner with their local authorities.

Cities are able to propose practical and concrete solutions for urban climate resilience, but the actions to achieve them should not be isolated. They have to fit into the urban planning processes of local governments and be incorporated into local development agendas so that the results are inclusive and sustainable. This planning therefore needs to be participatory, ensuring that it involves the most vulnerable groups (women, children, the elderly), and that it takes into consideration their local knowledge. Under these considerations, within the framework of the CRC Initiative, the implemented projects have found powerful opportunities to work in these cities. The projects combined research with participatory and inclusive processes, and designed methodologies, tools and solutions which are shared throughout this document.

The first chapter explores the different approaches used by the CRC Initiative projects to determine how vulnerable small and medium-sized cities are to disasters magnified by climate change, based on two key issues: first, the availability and generation of data and, second, how risk areas are determined and how the climate trends that affect cities are defined.

Based on the experience of the CRC projects, the second chapter shows how participation, dialogue and the incorporation of a gender perspective become indispensable conditions for building climate resilience. Participatory and inclusive processes towards the search for consensual solutions are aspects that strengthen local governance and generate collective capacities for urban planning, climate adaptation and sustainable development.

The third chapter presents a summary of the different solutions that the six projects have identified and developed to promote the construction of more climate-resilient cities. Solution proposals are described around different areas: plans, programs and policies, project design, technological innovation and prototype implementation. These solutions show that concrete actions, which respond to the needs of the population, contribute in a more inclusive and sustainable manner to climate-resilient urban development.

Finally, this document provides some conclusions about the complexity of climate change impacts for urban areas, the importance of local autonomy, the need to integrate climate resilience in urban planning, the contribution that small and medium-sized cities can make to meet the national challenges of resilience and adaptation. The document also points out the opportunities that cities have to further develop themselves, and urges local authorities and decision makers to consider resilience and adaptation vulnerabilities. All citizens need to be involved in the search for concrete resilience solutions as part of participatory and comprehensive urban planning.

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CHAPTER 1



DISCOVERING THREATS AND VULNERABILITY IN CITIES FOR EFFECTIVE ACTION

CHAPTER 1: DISCOVERING THREATS AND VULNERABILITY IN CITIES FOR EFFECTIVE ACTION

KEY MESSAGES

Building participatory processes for information gathering, starting from the knowledge of local actors, helps to collect and supplement data, and promotes the population's active participation. Moreover, it empowers them and improves their preparation and response capacities when facing threats. In these spaces the project's progress is validated by stages or phases, so that we can "ground" the results in local contexts.

Highlighting actions that are already being taken by local actors and linking them to national and global climate change agendas, strengthening the conditions for adaptation and resilience at the municipal level.

Institutionalizing means preventing risks and being prepared. Climate change can cause major damages and losses in cities. Therefore, it must be incorporated as a public policy with technical and budgetary resources to guarantee the sustainability of adaptation and resilience processes.

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Climate-change-related risks arise from climate trends, variability and extremes, as well as the vulnerability of exposed societies, communities or systems in terms of livelihoods, infrastructure, ecosystem services and governance systems. The adoption of effective measures for adapting to climate change and reducing associated risks should respond to the three aspects of risk: threats, vulnerability and exposure (CDKN, 2014). The latter two are dynamic due to changes in economic, social, demographic, cultural, institutional and governance circumstances. Additionally, strategies to strengthen resilience and reduce exposure and vulnerability must take into account local or regional specifics.

For Sakai, et al. (2017), the vulnerability concept applied to cities is understood as a multidimensional phenomenon that encompasses a city's sensitivity (which, in turn, depends on its physical, social and economic characteristics), its reaction capacities (current capacity to respond to the short-term

effects of an extreme climate event) and on adaptation (long-term capacity to plan, prevent and/or manage the impacts of climate change). Measuring vulnerability is key to understanding what aspects of cities must be strengthened to achieve climate resilience. The evaluation of each component of vulnerability can be done through various methods, each of which has its own characteristics.

There seems to be a widespread misconception that it is impossible for small and medium-sized cities to ascertain how vulnerable they are to climate change. Specialized human resources are limited, the necessary data does not exist or exists in different formats and, often, local authorities' awareness about the importance of the subject is still low. The urgency to solve everyday problems does not allow a medium and long-term vision. This contrasts with national and regional trends with many countries developing plans to adapt to climate change. Many are already in the process of drafting and implementation.

In some Latin American countries such as Peru, progress is also being made with Regional Climate Change Strategies (Estrategias Regionales de Cambio Climático – ERCC) that are also integrated into the Regional Concerted Development plans³. Some cities may have their own local adaptation plans, but, in general, this is not common and their degree of implementation is low. Planning efforts are being made at the national and regional level, but few such efforts are seen at the local level.

In light of these climate-induced changes, one of the key questions that decision makers ask themselves is: **How can I know the level of vulnerability in my city?** If there is no information on how climate change is affecting and will affect the local scale, it is difficult to define appropriate adaptation actions for urban resilience. The answer is not simple, nor is it unique, and it depends on the context of each city.

WHY IS IT IMPORTANT TO KNOW THE LEVEL OF VULNERABILITY AND RISK OF CITIES AND THEIR POPULATIONS?

Answering these questions will allow:

- a) communities to become more aware of how climate change affects them, so they can organize and demand action from local administrators;
- b) city authorities to position their condition of vulnerability in a national context where there is competition for resources;
- c) municipalities to know the actions that must be taken to adapt and reduce vulnerability; and
- d) cities to be able to request financial and human resources assistance from external sources, either national or international, based on the generated knowledge.

This chapter explores the different approaches that the CRC Initiative has used to answer these questions:

1. How was the existing data and information gathered?
2. How were risk areas determined and climate trends that affect cities defined?

1. How was the existing data and information gathered?

It is important to build on existing data and studies. For this, we need to identify the information that has been generated for the region or the city. Based on this information, it is possible to determine existing gaps in local information and develop specific research to fill in these gaps. In the projects of the CRC Initiative this has been key, since secondary information has been used in censuses, studies of other areas and institutions inside or outside the municipalities.

The first step in all the projects was to collect existing information and databases. Demographic indicators can aid in understanding the general situation of populations and cities.

³The Concerted Development Plan (Plan de Desarrollo Concertado) is the document prepared by the regional governments and local governments for their respective territorial areas.
Taken from: <https://www.ceplan.gob.pe/planes-territoriales/>

For example, in Coyuca Resiliente al Clima (Mexico), these demographic indicators provided key initial information that enabled a diagnosis of climatic risks threatening the Coyuca Urban Lagoon System (Sistema Urbano Lagunar de Coyuca – SULC). Databases that gave an account of the physical and geographic conditions of the system were reviewed. At the same time, census data provided a snapshot of the socio-economic and demographic conditions of men and women who live in the system and the infrastructure and characteristics of their homes.

The next step was to search the databases of other institutions and academic data. In all projects, secondary data from various sources was reviewed, compiled or systematized to generate a common database for each city or micro-watershed. In some cases, this collection of information was complex, specifically when exploring new concepts and approaches. In the project Cumbaza Resiliente al Clima (Peru), which examined the interactions between water, energy and food in the Cumbaza micro-basin, the main challenge was to quantify the relationships and interdependencies between these three elements, their use, accessibility and availability. In other cases, previous research contributed key information. For example, in the urban areas of the Amazon Delta in Brazil, a previous study evaluated the vulnerability of 41 cities and demonstrated that between 60% and 90% of the urban population lives in vulnerability with a moderate or high risk⁴ (Mansur, et al., 2016). The final result of this information-gathering processes was the creation of an aggregated database for the cities, with multi-sectorial information from various institutions, which gave rise to other studies, detailed in the next chapter. All the projects of the CRC Initiative found that the information and the existing data was insufficient to define the cities' vulnerability.

Knowing citizens' perceptions of the risks to which they are subject was essential in understanding the real vulnerability of the population, and it was the basis for the co-building of knowledge. This approach turned out to be key, especially in the following cities:

- Abaetetuba, Ponta de Pedras, Mazagão and Santana (the four cities of the Amazon Delta) where the study delved deeper into understanding the problems associated with flooding, such as food security and health;
- El Bejuco and La Barra (the two communities around Coyuca Lake) where the study focused on the population's strategies to deal with floods; and
- Nueva Ciudad de Belén (Iquitos, Peru) where the study identified the consequences of flawed housing plans for the community's welfare.

In addition to working with the community, project workers consulted with key stakeholders, either to provide new information or to validate the knowledge generated by scientific studies or climate models. When the necessary information did not exist, or was not on the appropriate scale, the researchers consulted with experts and key informants from each locality and affected community. This was done through interviews, group discussions, participatory workshops and focus groups, which helped supplement existing information and close knowledge gaps.

⁴The prepared Vulnerability Index considered the population that enjoys public water services, sewerage systems and waste collection; the proportion of individuals considered to be at greater socio-economic risk (children and the elderly, those with low levels of education and the inadequately housed); the incidence of waterborne diseases and average income levels.

During this process it was discovered that, contrary to expectations, **a wide variety of data and knowledge exists in each city to begin a diagnosis of the situation.** However, the data is fragmented and appears in different formats and scales. This complicates integration and comparison. Frequently, the administrations and organizations of the city do not know the type of information that exists and sometimes do not fully understand content and how it may provide the evidence for informed decision making. For this reason, as part of the projects, formats were combined and information was integrated, generating databases open to the community, readily available and at the different scales that are necessary for decision making.

It was also concluded that the analyses carried out with census information was valuable and appropriate for investigating vulnerability to climate threats. However, these censuses were regionally conducted and did not capture local specifics. They lacked information about access to basic services, pollution levels in the urban water supply and the level of maintenance, or lack of it, in city plumbing systems. In addition, information on this scale does not identify residents' perceptions of these problems and their knowledge about how to deal with them. Therefore, at this stage, it was essential to listen to the perceptions of the community through interviews, focus groups and workshops.

2. How were risk areas determined and climate trends that affect cities defined?

To understand climate variability and extremes in cities and their surroundings, the research centers and partner universities of the CRC developed local studies to complement the information gathering mentioned in the previous section. This involved, among other things, developing climate models using meteorological data, analyzing historical trends of climate events, and mapping at an appropriate scale to better visualize the situation. This was especially useful for quantitative data. Moreover, social vulnerability was defined, taking into account data from existing censuses and the perceptions of communities and affected groups through interviews and focus groups.

As previously defined, vulnerability is related to the historical record of economic, social, demographic, cultural, institutional and governance circumstances. In the projects CASA, Medios de Vida y Cambio Climático and Coyuca Resiliente al Clima, an effort was made to better define the socio-economic and gender conditions that exist in cities, and which make people even more vulnerable. Learning about these basic conditions was essential to advance the work with the community and in the definition of resilience actions.

In the six projects of the CRC Initiative three approaches were used to define **the factors that cause vulnerability in cities:**

1. Looking to the past and learning about climate trends;
2. Taking a snapshot of reality as it is today; and
3. Looking into the future using 20 or 30 years of climate projections.

The first project analyzed the past and examined climate trends based on the historical construction of how climate trends affected cities in the past. The project explored historic variations in rainfall and temperature in the cities of the Amazon Delta over more than four decades to show how the region's climate trends are becoming less predictable with regard to frequency and intensity. A clear increase in temperature is evident.

The second group took a snapshot of the current situation, using different methodologies and tools, with the aim of providing solutions to the problems found in the present that increase cities' vulnerability. As an example, in the Planeamiento Participativo project in the cities of Santa Ana, Santo Tomé and Dosquebradas, the QUICKScan⁵ tool was used. This is a methodology that facilitates the participation of all stakeholders and integrates existing information by displaying it on maps. This tool enabled the use of different sources and information formats and the exploration of alternatives, so as to co-build useful and necessary information for the preparation of a portfolio of action options to increase the climate resilience of these cities. A similar approach was used by the project Cooperación entre Ciudades Fronterizas, which developed an Urban Vulnerability Index (IVU) to generate comparisons, and a road map for the cities of Foz de Iguazú, Puerto Iguazú and Ciudad del Este.

The project Cooperación entre Ciudades Fronterizas developed an **Urban Vulnerability Index** built on 73 indicators that enabled the evaluation of the three cities in terms of vulnerability and their capacity to adapt and face a changing climate. The development of such indicators served to provide a first indication of the actions that are needed and where these must be implemented. Moreover the IVU allowed comparisons at an inter-urban level, creating a scale of priorities for adaptation actions.

This index was developed in a four-stage process:

1. In the first stage, based on a comprehensive review of the existing literature, the different dimensions and sub-dimensions of vulnerability (representing the priorities to be measured) were defined.
2. The next step in the sequence involved the development of a data model to capture the different elements of each dimension. To complement this information, a series of interviews was conducted in order to collect qualitative data from the strategic stakeholders when quantitative information was not available. Interviews led to the generation of a well-structured database. The data was subsequently classified and pre-processed.
3. In the third stage, all dimensions were combined to create an index.
4. The fourth step comprised analyzing the results and comparing them among the different cities. The results of this process demonstrated that the most vulnerable city is Ciudad del Este (IVU: 7.51) followed by Puerto Iguazú (IVU: 7.49), and finally Foz de Iguacu (IVU: 3.64).

⁵"QUICKScan is a methodology and a toolbox that facilitates the analysis and integration of the different knowledge, perspectives and needs of all actors in a decision-making process. It is an open and flexible source, which is used in workshops with actors, expert working groups or computer applications, through a facilitation that allows one to integrate knowledge and information to explore different options and use different sources and data formats, and display them spatially in the form of maps". Taken from: <http://www.quickscan.pro>

The third approach was used by the project Cumbaza Resiliente al Clima, which **looked towards the future** and generated scenarios that helped to understand the future risks posited by the socio-ecological pressures on the water-energy-food systems in the micro-watershed, and how these interactions change. Various supply and demand scenarios for resources were developed for 2030, 2040 and 2050, which took into account different regional economic development projections, as well as projections for population growth, changes in land use and climate variables obtained from simple linear and multiple linear regression models. The results of the quantification and the scenarios served as a basis to inform, identify and co-develop measures for risk reduction and key activities to promote resilience in the Cumbaza micro-watershed.

Reflections

First, although it is a challenge for cities to face the risks associated with extreme climate-change-related events and climate variability, **there is an erroneous belief about the lack of information needed for action**. These projects showed that secondary information sources, such as censuses, databases of municipal and regional institutions, as well as scientific studies and existing traditional knowledge, are very important to begin to put together the puzzle that will lead to an understanding of the vulnerability in urban and rural areas. However, it is also true that the qualitative and quantitative analyses used to define the cities' risks and vulnerability were limited, to a large extent, by factors such as the lack of data, the lack of access to data, a lack of temporal and spatial uniformity of information, and the different formats and sources. In many cases, the analyses will generate estimates, with a greater degree of approximation to reality, which are not necessarily decisive or definitive. To overcome these challenges it is important to generate open and accessible databases for the community. The generation of open databases, with varied sources of information and the capability of being systematized, yields a fundamental tool to generate effective planning for adaptation to climate change in local contexts.

Second, **the way to define vulnerability must be multi-dimensional, prioritizing the local reality for the co-generation of knowledge**. This manner of working, where the key stakeholders of the community and the vulnerable population are included in all stages, provides, in addition to inputs, a validation of actions. It also allows the identification of areas that require greater attention in terms of optimization, investment, management and clearly articulated policy guidelines.

Third, it is clear from this analysis that working with the local community is key, either to obtain local information on how risks and climate events affect them directly, or to validate the knowledge generated in different studies. As we will later see in the chapter on participation and gender, it is necessary to collect the different visions to generate appropriate actions for each social group.

Finally, understanding the vulnerability of cities within a local perspective helps bring about concrete actions that increase climate resilience and stakeholder commitment. Chapter 3 shows how specific solutions and options have been developed for concrete actions.

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CHAPTER 2



BUILDING RESILIENCE THROUGH PARTICIPATION, DIALOGUE AND THE INCORPORATION OF THE GENDER PERSPECTIVE

CHAPTER 2: BUILDING RESILIENCE THROUGH PARTICIPATION, DIALOGUE AND THE INCORPORATION OF THE GENDER PERSPECTIVE

KEY MESSAGES

Co-generating knowledge is essential in facilitating processes of adaptation and building climate resilience in small and medium-sized cities. This is achieved through sharing and systematizing existing information from various sources and sectors, complementing them with qualitative information, perceptions and experiences of local actors. An example of this is the work with communities living in cities and in rural areas to obtain key information on how they respond to extreme climate events and are thus able to understand their vulnerability and map their risk in a participatory manner.

For the construction of resilience, participatory processes are important. Such processes allow the generation of joint actions and diverse solutions. They also legitimize processes, empower local actors and impact on decision making.

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The CRC Initiative projects contribute to an understanding of how participation, dialogue and the incorporation of the gender perspective constitute fundamental conditions for building climate resilience.

Participation and dialogue constitute systematic processes of collaboration between academia, civil society, authorities, social and community groups. These stakeholders self-manage knowledge through inclusive dialogue, reflection and action spaces, which enable reciprocal learning (everyone learns from everyone), social empowerment and collective solution-building. As a result, local governance and collaborative conflict management are strengthened. (FFLA-CRC, 2017).

These projects have confirmed the added value of participation and dialogue in the research-action processes in which local stakeholders were involved. Knowledge building with key community stakeholders was a legitimate exercise to begin changing gender power relations in decision making. Additionally, it was important to incorporate a gender analysis in the vulnerability assessments and to value the role, voice and active participation of women in the promotion of climate-compatible strategies, actions and policies.

The gender perspective helps to make visible the inequalities in the exercise of rights, development opportunities and power relations between men and women and, in so doing, helps to transform these inequalities. This approach allowed the development of differentiated analyses of how climate change affects the social groups present in the researched contexts of vulnerability, according to their sex, gender, age, socio-economic status, geographical origin and other aspects that involve more or less vulnerability.

A gender perspective provided an understanding and assessment of each group's knowledge of adaptation and resilience, especially that of women, whose knowledge and skills are often invisible as a result of unequal gender relations.

Levels of participation

The participatory processes allowed the projects to validate, co-construct and enrich their research studies, enhancing an understanding of the diverse stakeholders' needs and helping to generate solutions to the cities' main climate vulnerability factors. This process formed a firm foundation for sustainable policies or decisions that promote urban climate resilience.

One way to represent the level of participation is through a ladder of participation (Figure 2)⁶ that identifies several steps or levels of power. The greater the involvement of the stakeholders, the greater the possibility of transforming power relations and promoting citizen empowerment in decision making. The proposed steps range from an informative and consultative participation, through a collaborative participation for co-management, to a participation for supervision and social control at the higher level.

As shown in the following graphic (Figure 2), the CRC Initiative projects mainly went through the first three levels: informative and consultative processes were carried out on the research problems and alternative participatory solutions were proposed, including the generation of policies, through collaboration and co-management. These processes elicited the contribution of authorities, NGOs, technical and academic bodies and grassroots organizations, with whom we worked in the research exchange and validation of information generated by the projects. Two of these managed to agree on mechanisms of oversight and control, with particular scopes, according to their contexts and processes. It is worth mentioning the efforts to involve the private sector mainly in the projects Cumbaza Resiliente al Clima and Cooperación entre Ciudades Fronterizas.

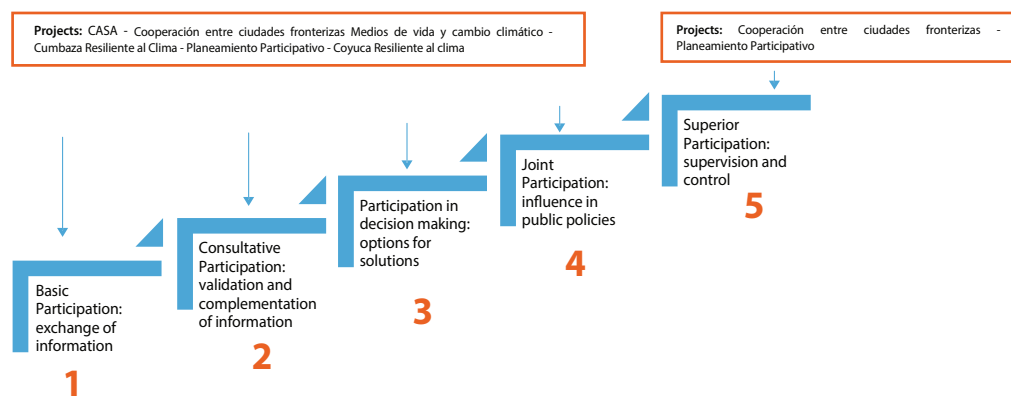


Figure 2. Participation Ladder in the CRC Initiative (Source: Vasquez, A., based on Prieto-Martin, 2010)

Consultative and basic participation: Exchange and validation of information

The information generated through research on biophysical and socio-economic factors affecting climate vulnerability in cities was validated and complemented by the perceptions and knowledge of different stakeholders and in different participatory spaces promoted by the projects. The strategies used for these levels of participation included exchange, validation and co-building, through various methodologies. These strategies are described in the following table.

⁶Proposed by Arnstein (1969) in Prieto-Martin (2010)

Table 2:

Participatory methodologies and stakeholders in the CRC Initiative

Projects	Methodologies used	Level of participation	Actors
CASA	<ul style="list-style-type: none"> Participatory methodologies Differentiated workshops 	Basic and consultative participation	Groups of men, women, boys, girls, professional associations, local municipalities, academia and local research institutes
Cooperación entre Ciudades Fronterizas	<ul style="list-style-type: none"> Participatory analysis on the vulnerabilities of cities in the three countries studied 	<ul style="list-style-type: none"> Basic and consultative participation Active participation and co-management 	Actors and sectors involved in public and private management
Medios de Vida y Cambio Climático	<ul style="list-style-type: none"> Participatory diagnosis (complements the data obtained from climatological stations with the opinions of the inhabitants) 	<ul style="list-style-type: none"> Basic and consultative participation Active participation and co-management 	Actors of local academia, technicians, local authorities and neighbors of the cities
Cumbaza Resiliente al Clima	<ul style="list-style-type: none"> Participatory processes of compilation, consultation and co-construction of data Participatory balance on natural resources, dynamics of rural consumption and water availability 	<ul style="list-style-type: none"> Basic and consultative participation Active participation and co-management 	Actors linked to the management of water resources in the public, private and community spheres
Planeamiento Participativo	<ul style="list-style-type: none"> QuickScan methodology and tool Participatory toolkit to identify resilient climate development options in three cities 	<ul style="list-style-type: none"> Basic and consultative participation Active participation and co-management 	Technicians and elected officials from the municipalities, civil society, NGOs, universities, central government ministries, neighborhood and community associations
Coyuca Resiliente al Clima	<ul style="list-style-type: none"> Gender-sensitive participatory methodologies and processes for the co-building of knowledge and the promotion of participatory governance Participatory and gender sensitive analysis on climate risks 	<ul style="list-style-type: none"> Basic and consultative participation Active participation and co-management 	Actors and local groups that are impacted by the effects of climate change

(Source: Vásquez, A., based on the final impact internal reports of the projects.)

HOW DID EXCHANGE AND VALIDATION OF INFORMATION OCCUR IN THE PROJECTS?

The **participatory analysis** in the project Cooperación entre Ciudades Fronterizas was developed through focus groups, workshops and forums in which stakeholders from three cities presented their points of view and possible solutions to address the identified vulnerabilities. Key institutions also participated in order to increase the capacity to cooperatively face the common challenges of planning for adaptation, disaster prevention, efficient management of climate information and the promotion of resilience.

Through multi-criteria workshops, 54 solutions, grouped into four categories, were prioritized:

1. Green infrastructure and infiltration measures;
2. Prevention and response measures;
3. Efficiency measures; and
4. Cooperation measures.

The **participatory processes for information gathering** of the Cumbaza Resiliente al Clima project generated a better understanding of the risks and impacts of climate change; change in land use, population growth and economic development in the Cumbaza micro-watershed. Data was collected and participatory consultations were held with multiple stakeholders of the basin, generating clear evidence on the balance of natural resources and the dynamics of rural consumption and water availability under existing socio-ecological pressures. The project also fostered a differentiated understanding by the stakeholders of the role and risks in the access, use and management of natural resources for different economic sectors, rural-urban stakeholders, men and women, at different levels (local-regional).

In the project Coyuca Resiliente al Clima gender-sensitive **participatory methodologies and processes** were developed for the co-building of knowledge and the promotion of participatory governance, through links between academia, the municipalities and community organizations. The project also produced a Gender-Sensitive Climate Change Adaptation Strategy (Estrategia de Adaptación al Cambio Climático) for the Urban-Lagunar System of Coyuca de Benítez (Sistema Urbano-Lagunar de Coyuca de Benítez – SULC), which is a tool that seeks to promote participatory and inclusive urban governance patterns that facilitate adaptation to climate change.

Participatory research allowed men and women of different ages from two communities belonging to the SULC to express their perceptions, needs and interests, making visible gender inequalities that influence climate change vulnerability.

Active participation and co-management

The information exchange and validation processes that the projects established in a participatory manner generated solutions related to their cities' climate vulnerability. These solutions were presented to the political decision makers, as was the case of the Planeamiento Participativo project in the cities of Santa Ana, Santo Tomé and Dosquebradas.

Some of the projects created meeting and dialogue spaces among different stakeholders, which strengthened governance processes in the cities, such as:

- **Climate Change Round Table in the city of Santa Ana (Planeamiento Participativo project)**
The Climate Change Round Table comprised representatives from NGOs, universities, municipalities and ministries of the central government. The Round Table constituted a space that, through monthly meetings, supported the collaborative work of dialogue and option analysis, among the involved stakeholders. During the execution of the project, an awareness campaign on floods and the creation of a municipal ordinance for territorial planning and land use in the south of the city were promoted. It is expected that the Round Table will maintain its advisory role in relation to climate change in Santa Ana.
- **Multi - Stake holder Platform (Coyuca Resiliente al Clima project)**
The Multi-Stakeholder Platform of the Coyuca Resiliente al Clima project involved the public sector, civil society and academia. Through this platform, strategies of co-production, dissemination of the project and knowledge exchange were developed that have motivated a better understanding of climate risks and the creation of capacities and inter-sectorial alliances for the drafting and implementation of adaptation strategies.
- **The Council for Sustainable Development of the Tri-National Region (Consejo de Desarrollo Sostenible para la Región Trinacional– CODETRI).** This council comprised the councils of economic, social and environmental development in the three cities and the Tri-National Network of Climate Sciences (Red Trinacional de Ciencias Climáticas) in Foz de Iguazú, Puerto Iguazú and Ciudad del Este (Cooperación entre Ciudades Fronterizas project).
The Council for Sustainable Development of the Tri-National Region, as well as the Tri-National Network of Climatic Sciences, arose as a result of the participation of diverse stakeholders during the research process developed by the project, in order to monitor the agreements generated by the stakeholders of the three participating cities.

Thanks to Coyuca Resiliente al Clima, the Municipal Civil Protection of Coyuca has recognized that this process established a good starting point for the SULC region. Even though there are regulations that formalize the inclusion of women in local emergency protocols, this had not materialized, since there was no awareness necessary to perceive it as a benefit. Through a multi-media platform, the project has opened the opportunity to approach the issue of earthquake risk, which is very common in Mexico, by including women's groups in this city.

In some cases influence in local policies was achieved. The Planeamiento Participativo project managed to reorganize the municipal institution of Santo Tome in Argentina. The former Directorate of Public Services and Hydraulics was divided, with the Hydraulics Department assuming the role of planning and monitoring hydraulic plans and works, as well as promoting resilience and planning in disaster risk management. This project, in addition, managed to establish a portfolio of project options for three cities on the subjects of land use planning and urban development, with a focus on climate change.

The project Medios de Vida y Cambio Climático allowed local stakeholders to get involved in replicating the solutions developed by the project in terms of prototypes for water and sanitation collection, helping families to gain access to clean water. The project also influenced planning at a higher level, incorporating climate change in the drafting of local development plans, through guidelines based on the evidence generated by the project. These guidelines were presented to the State Program of Urban Territorial Planning, an agency of the State of Pará that supports municipal development. In the case of Coyuca Resiliente al Clima, a gender-responsive and participatory climate adaptation strategy was structured, having local influence on the Multi-Stakeholder Platform.

Participation in supervision and control

Two of the CRC Initiative's projects promoted processes of supervision and control. The Council for Sustainable Development of the Tri-National Region has the role of overseeing the agreements reached among the involved stakeholders, with respect to cooperative solutions. Within the frame of the Planeamiento Participativo project, the spaces of environmental oversight for the community aqueducts of Dosquebradas strengthened their role and were linked to the technical staff of the municipality.

The gender perspective in building climate resilience

The effects of climate change affect the living conditions of people residing in vulnerable settlements in different ways, with those who are poorest harmed most. Among them are women, adolescents and girls, who are affected not only because of their social, economic and environmental vulnerability, but also because of their gender.

The differentiated impacts of climate change on men and women are linked to historical gender inequalities related to roles, knowledge and skills, the access, use and control of natural resources and production, power relations and women's participation in decision making.

The projects of the CRC Initiative show how women are more vulnerable to climate change impacts than men due to living conditions and disadvantages in their access to health and social security, employment and income generation. Women's vulnerability is also greater due to their subordinate position at home and community organizations and their excessive domestic workload. Situations of conflict and violence also limit the exercise of their rights.

It was demonstrated that most of the women who participated in the surveys, focus groups or interviews play a dominant role in many tasks - for example in the care of family members, in productive activities that support the family's economy, and in community participation. However, it has been found that they are absent in the decision-making spaces, where their opinions, particular needs, capacities, and contributions are not taken into consideration.

Making gender gaps and differences visible in the assessment of climate vulnerability is an opportunity to plan adaptation actions that include men and women and other population groups. Above all, it is an opportunity to promote structural transformations in the future, in relation to inequalities, asymmetric power relations, use, access to and control of resources and decision making. It also contributes to making visible the value, roles and experiences of women as critical stakeholders in building climate resilience.

Why is gender analysis important in understanding climate vulnerability?

Addressing the effects of climate change and adapting to them depends on a variety of circumstances, including the socio-economic conditions, governance conditions, cultural and political conditions of a population. Assessment studies on climate vulnerability require an in-depth analysis of these factors. Gender analysis makes it possible to deepen the understanding of how differences between men and women, in relation to their poverty level, their knowledge, their development opportunities and their participation in decision making, contribute to vulnerability. However, this analysis also makes it possible to see their skills, knowledge and ways of adapting, which, when made visible, valued, and shared, contribute to resilience building and the promotion of equity.

Evidencing and working on these aspects constitutes an opportunity for the transformation of structures of inequality, inequity and asymmetric power relations that come to the surface when analyzing vulnerability in an integral manner.

How did the projects of the CRC Initiative incorporate gender analysis in the evaluation of climate vulnerability?

To better understand climate vulnerability and the socio-economic and cultural factors that underlie it, four of the CRC projects identified gender gaps and differences present in medium and small cities in Mexico, Peru and Brazil. The research teams used qualitative and quantitative methodologies, which are detailed in the following table:

Table3

Gender-Sensitive Methodological Tools of Analysis

Project	Methodology	Objectives relating to gender	Tools
Coyuca Resiliente al Clima	Gender-sensitive climate risk diagnostic	<ul style="list-style-type: none"> • To make visible gender inequalities in two communities • To explore men and women's activities, capacities and assets, when facing severe climate conditions • To identify what men and women do before, during and after a climate event • To identify the differences in the effects of said events in the lives of men and women 	<ul style="list-style-type: none"> • Consolidation of statistical data: (i) population, age and sex groups; (ii) level of schooling by sex; (iii) economically active and inactive population by sex; (iv) households by who heads them; access to health services, and marital status • Focus groups, in-depth interviews
	Gender-sensitive governance diagnostic	<ul style="list-style-type: none"> • To make visible the role of women in the process of materialization of public policies • To understand power relationships • To sensitize people regarding inequalities in power relations between men and women and State-society 	<ul style="list-style-type: none"> • Identification of public actions and both State and non-State stakeholders • Mapping of the processes of implementation disaggregated by gender (synchronous analysis) • Tracking of trajectories of stakeholders, institutions and relationships (diachronic analysis) • Characterization of governance patterns and the differentiated roles within civil society, particularly the roles of women

CASA	Social diagnostic with a gender focus	<ul style="list-style-type: none"> To identify vulnerabilities and capacities in the context of the project, in relation to gender (gaps and empowerment) 	<ul style="list-style-type: none"> Gathering of statistical data on education, sexual and reproductive health and economically productive activity through surveys and secondary sources Qualitative information: perceptions on use, access and control of resources, gender roles and women's participation through: semi-structured interviews, workshops with games, testimonies, and direct observation
Medios de Vida y Cambio Climático Delta del Amazonas	Case study: Differential vulnerability in Chicolandia, Abaetetuba, Pará, (Brazil)	<ul style="list-style-type: none"> To inquire about differential exposure, sensitivity and possible strategies for resilience, in relation to the risk of floods and land sinking 	<ul style="list-style-type: none"> Relationship between single mothers and food insecurity Surveys, open questions, life stories
Cumbaza Resiliente al Clima	Workshop minutes	<ul style="list-style-type: none"> To identify gender relations and their correspondence with the elements of the nexus: water, energy, and food. 	<ul style="list-style-type: none"> Game exercise: A day in the life of Juan A day in the life of Maria

(Source: Vásquez, A., based on the internal technical reports of the CRC projects)

The information generated by the projects helped to understand how the gender analysis category relates to climate vulnerability, providing recommendations to overcome the differences and gender inequalities found in each context, in order to build climate resilience with equity.

For the *Coyuca Resiliente al Clima* project, the generated information supports the Gender-Sensitive Resilience Strategy, a fundamental tool to provide continuity to the Multi-Stakeholder Platform promoted by the project. The research has strengthened the capacities of local actors, mainly from local academia.

A group of students from the Autonomous University of Guerrero have aligned their processes with society, incorporating the gender approach into projects related to: mangrove reforestation; tourism and gender; the strengthening of the capacities of women in the communities (self-knowledge based on dance); agroforestry in the Coyuca high zone, and gender-sensitive risk management. Currently, one of the master's students is part of the civil protection technical team of Iguala, a municipality belonging to the State of Guerrero.

The *CASA* project fostered the transfer of appropriate technology prototypes for the promotion of economically productive activities in Nueva Ciudad de Belén and strengthened a women's community lunchroom, contributing to their empowerment. In another area, this project used a community inclusion approach to minimize situations of conflict and violence that are common in this city and which affect the participation of women in the community.

Why does a gender-differentiated vision improve adaptation and promote equity?

Both the project teams and the populations with whom they interacted developed an understanding of how climate phenomena that apparently impact the population in a general way have specific implications for men and women.¹

The information generated by these projects has allowed the identification of aspects that mark differences in the daily experience of women, men, boys, girls and adolescents. Some gender gaps and inequalities are exacerbated in specific situations of climate disasters, increasing the weaknesses of the most vulnerable populations and decreasing their possibilities of response and adaptation.

WHAT ARE THE ASPECTS OF GENDER-DIFFERENTIATED VULNERABILITY?

- In Coyuca, a large proportion of the female population is illiterate or did not finish basic studies. The average level of schooling for the male population is 7.9 years, while for women it is 7.4 years.
- In Coyuca, women have limited access to the formal labor market and, therefore, to the health rights associated with having a fixed and formal job, unlike males who represent more than 60% of the employed population. In the percentage structure of the economically inactive population, the female population predominates with 75% for El Bejuco, and 80% for La Barra (López, 2017).
- In Nueva Ciudad de Belen, 26.8% of the total men who study, manage to finish high school. In the case of women, only 22.5% manage to do so. Most drop out due to pregnancy.
- The situations that most affect the population of Nueva Ciudad de Belen in Iquitos are child malnutrition and teenage pregnancy. The second cause generates barriers that prevent girls and adolescents from accessing education, thus maintaining and reproducing the cycle of poverty and the lack of opportunities across generations, as well as the risks of neonatal maternal morbi-mortality. Another aspect that is related to this problem is the high rate of sexual violence.
- In the Cumbaza River micro-basin, rural women face difficulties in accessing scarce biomass for food preparation, which forces them to spend more time searching for firewood. On the other hand, the holders of rights of irrigated rice plots are mostly men (which reflects an issue of gender inequality in land ownership), and the role of women in this activity is confined to salaried work as part of family groups that have specialized in rice planting and harvesting under irrigation.
- Women heads of household in Chicolândia (Abaetetuba) reported their difficulties in accessing food, and mentioned that their children frequently had only one meal a day or went a day without eating. This is directly related to the limited opportunities of formal or informal paid economic activities. Often, these women exchange care jobs for food with members of other families.

Through hydro-meteorological events, climate change reduces food availability and water security, especially affecting women and children in impoverished neighborhoods, who have fewer physical, financial, and participation resources in decision making at the community. This limits their ability to adapt.

In disaster situations, the women of Coyuca and Abaetetuba have the responsibility of guaranteeing water, food and care at home. In these localities, malnutrition, diseases related to the use of polluted water and limited access to quality education mainly affect children and adolescents, who also face sexual violence and early pregnancy issues.

In Amazonian contexts and in the coastal zones of Mexico, women make greater efforts to obtain water and food when extreme climate events take place. In addition, women are often the first ones to react to a climate disaster, since they are commonly found in their homes when these events occur. They lead actions to safeguard the life of their family and organize themselves within the community, but their contribution is not considered in the decisions made to face disaster situations.

"THE WOMEN OF GUERRERO ARE WARRIORS"

This phrase, repeated by men and women from the communities of Coyuca, reinforces a gender stereotype that normalizes the overload of women's work when adverse climate events occur. Women have the skills and strength to face this type of event. They are the ones who lead the provision of supplies to cover family needs and community organization. Even when it comes to demanding solutions from the authorities, they carry the voice of protest and they are the ones who demand answers. However, when the project inquired about their participation in decision making, it was noted that they did not express their opinion and were not part of the official decision-making processes.

"CHINGAR Y JODER"

During a meeting of fisherwomen in Oaxaca in March 2018, in which an Acapulco delegation, supported by the Coyuca Resiliente al Clima project, participated, it was evident that women have developed extreme strategies to be heard. "Chingar y joder" is an expression used to elicit response actions to their requests⁷.

This shows the existence of a trend to devalue their voice and opinion. In order to be listened to, women are forced to 'cry out' to the authorities.

Making visible the differentiated vulnerability of women and other population groups, as well as the capacities of each one of them – for example, the enormous potential of women to face and lead actions when climate disasters occur – deserves particular consideration by the authorities and the population. Broad awareness and advocacy work is required to foreground the issue of gender equality as an element in decisions and actions to boost climate resilience.

⁷Testimony of Nadia Alvarado Salas, member of the Association of Indigenous and Afro-Mexican Women Settled in Acapulco (AMIARA AC).

Reflections

- Climate change affects the population in a differentiated way. To improve the capacity for adaptation and increase resilience, the visions and experiences of the different social groups (women, men, children, the elderly, the indigenous) must be incorporated into climate action plans. Each group provides important solutions derived from their roles, experiences and knowledge. Women, given their reproductive and care role (family, community and environmental), have developed specific knowledge and have the capacity to respond comprehensively to risk.
- We need hard statistical data and qualitative information that is useful to sensitize decision makers and policy makers, so as to deepen their understanding and drive home the urgent need to incorporate this perspective in their actions, policies, programs and projects. This is needed not only in the planning and management of climate risks, but also in the planning and management of development. Strengthening the vision of gender differences contributes to a necessary coordination between development policies and climate policies that promote equality.
- It is necessary to raise awareness among actors and decision makers of the intrinsic link between gender and climate change with evidence-based information such as that generated by the CRC Initiative, so that this approach can be incorporated into local planning and climate finance processes. Additionally, it is necessary to work on the construction of gender and climate change indicators that include issues such as use, access and control of resources, gender violence and the co-benefits of projects. This needs to be done in order to transform gender relations in cities, with the aim of monitoring and evaluating the impact of policies.
- It is essential to build the capacities of authorities and civil society with regard to global processes and international, national and local instruments that promote a comprehensive vision of the aspects mentioned here. In this framework, the promotion of Sustainable Development Goals, especially SDG 5, has special significance, as do the Gender and Climate Change Action Plans of the different countries.
- The formulation of public policies in the face of climate change requires participatory processes that contribute to understanding the climate phenomenon in its complexity and its interdependence with social, economic and cultural aspects. This, in turn, requires a view that recognizes the negative effects of climate change but also the capacities of men, women and other population groups to tackle these effects. Thus, policies, programs, projects and risk management plans, and adaptation and resilience strategies will be more effective and more likely to foster equality.
- In conclusion, the important issues to consider in relation to gender, climate change, vulnerability and resilience are gender roles in the provision of water, food and energy, and the strategic interests of women such as education, sexual and reproductive health, gender violence and participation in spaces of power.

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CHAPTER 3



INSTRUMENTS, POLICIES AND PRACTICES TO DEVELOP CLIMATE RESILIENCE

CHAPTER 3: INSTRUMENTS, POLICIES AND PRACTICES TO DEVELOP CLIMATE RESILIENCE

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KEY MESSAGES

Actions to increase resilience are not expensive. The evidence indicates that impact and low-cost solutions can be applied, and that the costs of inaction are higher than the costs of action.¹ Some ideas that emerged from the projects included:

- The establishment of a Municipal Fund aimed at resilience and adaptation, so as to have financial resources focused on prevention and response actions that reduce the impacts of climate events.
- The prioritization of actions for resilience which generate co-benefits for local development, optimizing municipal investment. For example, in the city of Dosquebradas, the municipal administration prioritized actions that will increase climate resilience in its existing budget.

The use of easily accessible technological tools allows local stakeholders to appropriate and prepare actions to respond to risk situations.

This chapter presents a summary of the solutions proposed by the six projects, emphasizing the fact that participatory planning and implementation processes are the basis for generating urban climate resilience.

Based on the cities that were part of the CRC Initiative, it is apparent that data and knowledge sources do exist, but their availability is fragmented and they exist in different formats and scales. This complicates their integration and comparison, limiting the possibility of defining vulnerability based only on scientific information. The projects found that one way to overcome this limitation was to learn about and integrate citizens' perceptions of the risks they experience. This approach helped generate a co-building of knowledge, allowing the reconciliation of formats and the integration of information into open databases, available to the community at different scales. Such databases are necessary to make decisions.

Through participatory processes involving multiple stakeholders and sectors in articulation, dialogue and collaboration, the CRC projects produced diagnoses and solutions that strengthen local governance and generate local capacities for climate resilience.

Adequate plans, programs and policies

Most projects started with little information about the impacts of climate phenomena and their city development plans did not include this variable. From the start, the proposals for solutions among the projects were diverse, ranging from carrying out capacity-building processes, to building road maps for the incorporation of these issues into local planning, to influencing legislative processes so that climate change is included in city regulations.

In relation to the legal framework, the Cumbaza Resiliente al Clima project was based on the premise that adequate management of natural resources requires laws and regulations that are consistent with each other as well as efficient inter-institutional coordination.

At this point, the project generated a governance analysis, which researched the consistency of policies and the regulatory framework, a comprehensive task that identified gaps. Based on these analyses, the stakeholders established their priorities and commitments, which were set out in a road map. The road map defined the steps to follow in order to incorporate the results of the quantification of this link within their planning, and so adopt the corrective measures for an efficient use of natural resources. This road map is expected to guide local institutions in each sector on what actions to take to improve the management of resources (forests, water, energy, food) and to develop green infrastructure adapted to local realities.

The CASA project developed a guide with guidelines and strategies that visualize alternatives to city urbanization and expansion processes (Figures 3 and 4). In order to reduce the impacts of unsustainable extractive activities while reducing levels of vulnerability to unexpected changes, the guide is supplemented with proposals for the diversification of the economically productive activities in which the population is engaged. Participatory work in the development and co-design of sustainable common spaces promoted resilience and adaptability in the population and public authorities.

Two pilot projects were implemented in Nueva Ciudad de Belén in order to generate evidence on the possible positive effects that could result from implementing an entire sustainable urbanization system in the long term:

- Gestión Comunitaria para Convivir (Community Management to Coexist) emphasizes participatory decision-making processes.
- Soporte para Convivir (Support to Coexist) poses the need to develop climate-compatible livelihoods that are fair, inclusive and articulated to urban development plans.

Figure 3: Urban Design: Resilient and Sustainable Amazon City

<http://casapucp.com/>

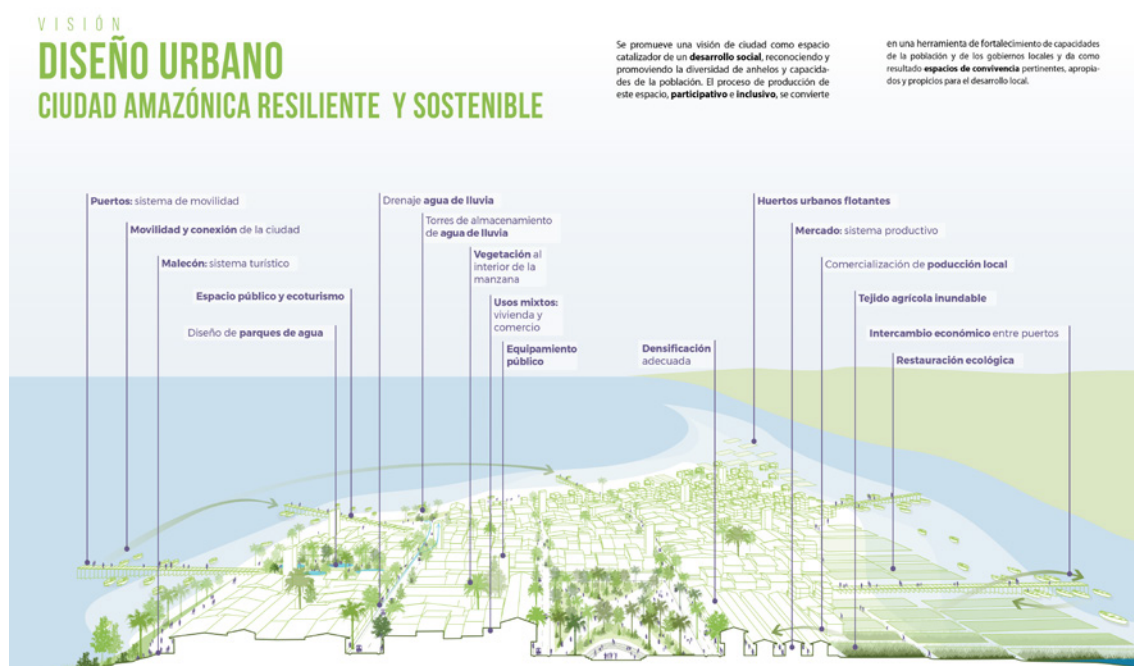


Figure 4: Local, Relevant and Bioclimatic Amazon Architecture(Source: <http://casapucp.com/>)

Solution portfolios adapted to cities

Two projects worked on proposals for city solution portfolios. Coincidentally, the projects were implemented in cities in different countries, and although the portfolios do contain common methodologies and similar solutions, they were built according to the reality of each place. Within the Planeamiento Participativo and Cooperación entre Ciudades Fronterizas projects, participatory exercises were carried out to define these solutions. Implementation conditions were listed for each project (for example, including a project in the municipal budget), as were the costs, potential responsible and co-responsible officials and the limitations of the cities to implement the solutions.

The Planeamiento Participativo project proposed basing its work on each of the cities' existing planning instruments, processes and information, and, in some cases, on securing a budget to facilitate implementation. For example, stakeholders' perceptions served as a starting point to build a consensus-based list of action options, conducive to realistic and implementable proposals, and anchored in ongoing processes or the strong interest of local stakeholders.

In the case of the city of Dosquebradas, the proposed solutions were aligned to the 2016-2019 Development Plan "Commitment of All" (Compromiso de Todos) and this made it possible to identify priorities. In the case of Santa Ana, the project proposed as a solution the creation of a Climate Change Board with the participation of different stakeholders in order to carry out advisory and consultation activities with decision makers. In the case of Santo Tome, the issue that most concerned local stakeholders was the risk of flooding. The proposed solution was to review the organizational structure of the municipal government and, at the same time, devise a change of approach to address the risks.

Similarly, in the triple border area between Paraguay, Argentina and Brazil (Cooperación entre Ciudades Fronterizas project) a Steering Committee was formed that contributed to the construction and validation of the vulnerability study mentioned in Chapter 1, and proposed solutions to manage climate change. The solutions were grouped into four categories as outlined in the following table:

Table 4:

Categorization of the Solutions Proposed by the Cooperación entre Ciudades Fronterizas Project

Category	Solution
Green infrastructure and infiltration measures	<ul style="list-style-type: none"> • Infiltration trenches are sustainable drainage systems to reduce the impacts of floods. These systems facilitate the absorption of water by the soil, thus counteracting the large amount of waterproofed surface generated by urban development. • Reforestation of stream banks with native tree species reduces soil erosion, regulates the flow of the channels and purifies the water. • Rain gardens increase the infiltration capacity of water in the soil and reduce flooding. • Greening cities with native and exotic tree species, using public spaces such as State schools, recreational spaces or parks and sidewalks, aims to reduce heatwaves, contribute to water regulation and purify the air. • Urban agriculture promotes food and nutritional security of the population. • Green walls and roofs increase the area covered with vegetation in the city in order to reduce the outside temperature, promote the efficient use of energy by generating greater thermal insulation of buildings and contribute to reducing air pollution.
Prevention and response measures	<ul style="list-style-type: none"> • Financial planning for disaster risk reduction which includes, for example, the creation of a municipal emergency fund, ensures that financial resources are available for prevention and response actions, which will reduce the possible impacts of climate effects. • Relocation of houses, mainly those that are threatened by floods due to their proximity to river banks and gullies.

Efficiency measures	<ul style="list-style-type: none"> • Waste management (differentiated collection, recycling, composting) reduces the stagnation of drainage systems and the proliferation of diseases. • Harnessing solar energy reduces energy costs and greenhouse gas emissions. • Harnessing rain water contributes to the provision of water for cleaning, irrigation, sanitary use and washing machines. • Efficient water use programs in municipal public schools through the purchase of new sanitation equipment and educational campaigns.
Cooperation measures	<ul style="list-style-type: none"> • The Tri-national Network of Climate Sciences, composed of a set of institutions in the triple border region, aims to generate and disseminate climate information relevant to decision-making processes. • The Council of Economic, Social and Environmental Development of the Triple Border seeks to be a diplomatic body of a deliberative and consultative nature. It has with the capacity to formulate, promote and articulate actions and policies aimed at promoting the sustainable and integrated development of the region. • Capacity-building programs on climate adaptation must be carried out jointly among the three cities to enable the incorporation of climate variables into their plans and projects. • Public awareness campaigns in risk reduction develop better prevention and response capacities to face climate change. • Integrated disaster risk management focuses on the development of integrated contingency plans, specifying the actions to be adopted by the three municipalities. The plans consolidate the existing cross-border cooperation and explore new strategies to respond to climate contingencies in a cooperative manner.

(Source: Villacís, M. based on Sakai et al., 2018)

The team proposed pilot projects for most of the solutions in order to evaluate their effectiveness before proposing extended implementation. According to the calculations made, the cost to start up and maintain all the solutions in the Triple Border is around US\$230 million.

With a lifetime of 20 years for most solutions, the annual cost would be approximately US\$11.5 million each year for the three cities in total, which corresponds to 0.3% of the GDP in the Triple Border cities.

The benefits (economic, social, environmental, etc.), on the other hand, are, on average, 3.5 times greater than the costs, making the investment cost effective (Sakai et al., 2018). It is worth mentioning that cost-benefit studies are not common in resilience initiatives; therefore this project presents an innovative and significant activity.

Technological innovation

The Medios de Vida y Cambio Climático project developed an application (Aqui Alaga APP)⁸ for the collection of data on floods caused by rain and rising tides for the small cities of the Amazon Delta. This application makes it possible to obtain information almost immediately, so that the corresponding agencies can act quickly against the impact of climate phenomena. The application is easy to access and use through mobile phones and the information that users generate is transmitted to planners and aid agencies. Currently, the tool is being used in the municipalities of Belém, Abaetetuba, Ponta de Pedras, Mazagão and Santana. Training workshops taught citizens how to collect data and locate the data geographically. This application is being developed in collaboration with the Amazonia Protection System (SIPAM), so that anyone can receive alert data from the government climate radars, and so that users in the small cities of the Amazon Delta can validate the data.

Prototypes: Practical, collective and low-cost solutions

Although it was not the objective of the projects to implement the proposed solutions, two projects managed to develop pilot prototypes to show that collective work can reduce the costs of implementing practical adaptation measures, and thus contribute to the climate resilience of cities.

Rainwater collection system prototype

The Medios de Vida y Cambio Climático project developed a prototype of a rainwater collection system, which was installed in a vulnerable area of Abaetetuba (Chicôlandia), and in Ponta de Pedras (Rua Capitão João Tavares).

As stated in the Internal Final Impact Report of the Medios de Vida y Cambio Climático project:

The prototype consists of a channel through which rainwater from the roof is conducted into pipes through a filter system and stored in a water tank. The filter system is simple; it separates the largest residues, the water passes through a limestone rock that regulates the pH, and finally chlorine is added to complete the filtration of the residues. Based on this treatment, water can be consumed safely, even for drinking.

⁸ <https://appaquialaga.wixsite.com/odkpp/guia-de-instalacao-do-app>

The 1 000 liter tank fills up in just seven minutes of rain, so it can be shared with other families. In terms of costs, the prototype also has advantages, compared to the construction of a deep well, and even more compared to the construction of a water supply system in a flood area. The prototype can be shared by 3 families, with a total average cost of approximately US\$ 800 (BRL 3 000), without considering the labor force, which was voluntary in the two prototypes installed. If a consumption of drinking water of about 200 liters per week (US\$2/20 liters) is considered, a family that buys water for consumption would save about US\$20 per month. For a group of 3 families, the cost of the prototype would be paid [for] in 1 year and 3 months (US\$260 per family).

This was a successful pilot experience and, after the completion of the project, the team found that several similar systems were installed in Chicôlandia. It is expected that, eventually, local authorities will implement it in other houses and neighborhoods. In fact, in the month of November 2018, a community of the Algodoal Neighborhood Church in Chicôlandia evaluated the rainwater collection system and donated the material for the construction of similar ones to 30 low-income families.

An imitation of this prototype was also implemented in Nueva Ciudad de Belén (CASA project), using pipes to store water, which also act as a space-separating wall, promoting ventilation, since it is a permeable wall.

The CASA project also developed other prototypes, located in the communal area of the population called Maloca, where the residents use them in a shared manner and a committee has been formed to protect and maintain the prototypes. All prototypes have guides (available on the web portals of the CRC Initiative and the CASA project⁹) on how to build them step-by-step and how to maintain them.

Solar grill prototype: Nueva Ciudad de Belén is located in a buffer zone of a nature reserve, where its inhabitants use traditional grills and burn firewood to cook their food. The project team identified the need to provide alternative solutions to reduce the use of wood for this activity, developing a grid that works with solar thermal energy. This prototype also takes into account the ancestral tradition of cooking food outside the home, avoiding health problems derived from direct smoke inhalation, such as ophthalmological and respiratory complications. The prototype is easy to assemble, occupies little space and was built with accessible technologies and materials in Iquitos.

Improved kitchen prototype: This energy-efficient stove, while still using firewood, coal and sawdust, combines a grill with a chimney, which prevents the dispersion of heat. The prototype has two cooking chambers, a grill-shaped burner and a second burner that receives direct fire.

⁹CASA www.casapucp.com /IniciativaCRCwww.crclatam.net

Improved window prototype (mosquito net): People felt very hot inside their homes due to the glass windows and concrete used to build them. Having identified the need, the project designed a mosquito net window to promote better air circulation inside the home, adding blinds for privacy and, for security, including an "X" in the design to prevent the entry of larger animals. In order to be replicated, the prototype was implemented in a pilot house and was found to reduce the inside temperature to 2°C lower than the outside temperature, while homes with glass windows were 4°C hotter inside than outside.

Reflections

When proposing solutions to climate change, it is important, from the start, to offer stakeholders (including the most vulnerable groups, and all levels involved in decision making) the means and tools for active participation and empowerment, so that they can appropriate the implementation of the identified solutions. Additionally, innovation plays a very important role, because these solutions must respond to people's needs, adapt to local contexts and become sustainable alternatives for the areas where they are implemented.

In this context, the solutions proposed by the projects were directed towards promoting processes using a comprehensive and multi-level approach. They reinforced the importance of participation and decision making from the bottom-up, thus motivating agreements between stakeholders from different sectors to seek joint solutions. This shows that research projects that promote concrete actions and respond to the needs of the population have the greatest impact and contribute to urban development and resilience.

Finally, as each of the projects of the CRC Initiative has shown, it is necessary to consider that the solutions must adapt to two clearly identifiable characteristics of climate change at the local level:

1. Heterogeneity (i.e. each region or city is affected differently). For example, what may be devastating for a coastal area may be perceived as an improvement in climate for a mountain region.
2. Uncertainty (i.e. the time, magnitude and location of the impacts cannot be exactly known). In this sense, investment in innovative activities to face the effects of climate change will continue to evolve as knowledge continues to develop (Zilberman et al., 2018).

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CONCLUSION



CONCLUSION

Author: Emily Wilkinson

This report reflects on some important lessons and opportunities for thirteen small and medium-sized cities in Latin America as they grow and take on the multiple and interconnected challenges of deteriorating water quality, more frequent storms and flooding and soil erosion, as well as the informal occupation and development of land in high-risk areas. These cities have an opportunity to develop in a way that minimizes the risks associated with climate change, now and in the future.

This report offers hope for cities suffering from multiple environmental and developmental challenges, even those with significant gaps in professional and administrative capacities and severely limited financial resources. The report underscores the complexity of climate change impacts in urban areas, and specifically, the gendered nature of climate vulnerability. If city authorities fail to take these gendered vulnerabilities into account, or engage people in finding solutions through participatory urban planning, they may lose the opportunity to do so with relatively small-scale, manageable solutions.

These projects demonstrate that, at the local level, resilience building can and should be integrated into development agendas. Small-scale initiatives that seek to improve urban services, manage climate risks and promote development can directly address local needs and priorities, helping local stakeholders to thrive and prosper in the face of environmental change as their cities grow.

The contribution of climate resilience to development (and vice versa)

Adaptation and resilience actions are often discussed and proposed in isolation from development planning. However, these CRC projects reveal the interrelated nature of climate resilience and development (particularly social development), even through the provision of improved urban services. Resilience actions contribute to development goals and vice versa.

By undertaking research and analysis at the local level, with the participation of different social groups, the CRC projects have been able to understand the complex interactions between climate change and extreme events, social and economic conditions and environmental processes in a way that would not have been possible at a larger scale or without the participation of local stakeholders. This process has brought into sharp focus the interrelationships and interdependencies of climate resilience and local development needs and goals.

CRC projects are multi-pronged (essentially multi-sectorial) and have contributed to multiple social development objectives simultaneously, without visibly causing harm in any domain. The CASA project, for example, is making progress in terms of strengthening livelihoods as well as explicitly addressing food security and the empowerment of women and girls.

Similarly, the Medios de Vida y Cambio Climático project is addressing the health and water access problems exacerbated by climate change by developing a rainwater collection system so that families have access to clean and safe water from rainfall. These interdependencies were made clear through the vulnerability assessments conducted in each of these projects, underscoring the importance of undertaking this kind of analysis in both climate resilience and development initiatives.

Research conducted as part of the CRC projects has also highlighted how multiple factors interact to shape the vulnerability of different groups and hence provide a starting point for identifying actions to improve resilience and well-being. Gender roles, the use, access and control of resources, and women's practical needs and strategic interests all shape women's and girls' vulnerability, and so action to build resilience needs to focus on these. It is at the local level where support services can be effectively delivered to prevent girls from dropping out of school, and these services will have spillover benefits for achieving climate-resilient development.

The importance of local autonomy

A vision of climate-resilient cities does not have to be imposed by the national government: it can arise through local initiative and build on local knowledge.

Collectively, the projects funded under the CRC Initiative have demonstrated significant progress in identifying and implementing appropriate actions for climate resilience in a relatively short time frame. This has been achieved by harnessing local knowledge and catalyzing collective action and knowledge sharing, with very limited national input or external resources. CRC projects have managed to tap tremendous reservoirs of human capital by providing a small resource to help organize people, bring them together, introduce contextual information and promote joint analysis of climate-change impacts and sources of vulnerability. The Cumbaza Resiliente al Clima project's analysis of the river basin is a good example of this. The projects have played a catalytic role, helping people to validate their own lived experiences and build their self-confidence and agency in promoting greater climate resilience.

Valuing these local (non-financial) resources is therefore critical to climate resilience in cities, but local governments will need additional resources to take forward many of the ideas created by the projects. The projects demonstrate that climate resilience can and should be locally built, but ultimately the success of local initiatives will depend on being able to access external resources.

Some of these Latin American countries have high levels of decentralization on paper but, in practice, local governments receive very low levels of funding through fiscal transfers to spend on priorities, and the majority is earmarked for specific sectors to implement national initiatives. To truly value and support local action, greater fiscal and administrative decentralization is needed.

Results from the CRC Initiative therefore support a localization agenda in climate resilience, recognizing that, even in small cities, a lot can be achieved without a national strategy or national programs to guide local processes. Local authorities can innovate using their own resources (and those of their partners) and small and medium-sized cities can be engines of change.

The benefits of a new, more integrated style of planning

A new style of local development planning is needed to deal with the complexity of climate-change impacts and the interaction of climate vulnerabilities with other social and economic development challenges. Efforts under the CRC Initiative to undertake planning involving multiple actors and across sectors were critical to understanding risk and adaptation options and demonstrated that this kind of planning is possible. But it is not the norm and needs to be institutionalized, so all local development planning is a process of multi-stakeholder consultation, integration and knowledge sharing.

In some of the projects, new institutions have been created to help promote this kind of multi-sectorial planning in the future, but these now need to be recognized in law and supported by local and national governments. Essentially, this form of multi-stakeholder planning will require a shift in local governance so that complex and multiple sources of data may be used and different social groups have a voice. In the thirteen Latin American cities where these action-research projects took place, local governments have realized that high levels of risk are creating huge development challenges and were keen to engage in these projects. The next step is to convince them of the need to share the responsibility and use local resources more effectively in decision making going forward.

Governments should see their role in climate resilience as promoters of collective action through partnerships with multiple actors and between different territorial levels (horizontal and vertical governance), including universities and permanent dialogue platforms.

The development of new planning tools

The projects also demonstrate the benefits of using multiple and innovative urban planning and design tools and instruments to enhance climate resilience in cities. This is implicit in several international agendas, but especially in the Regional Action Plan for the Implementation of the New Urban Agenda in Latin America and The Caribbean in its objective 3.10⁹, which mentions the importance of *Planning for urban and climate resilience through urban and territorial planning instruments and urban design*. Within this objective, it is essential to:

⁹CEPAL, MINURVI, ONU Habitat, (2017), Plan de Acción Regional para la implementación de la Nueva Agenda Urbana en América Latina y el Caribe 2016 - 2036, Santiago de Chile.

- develop urban policies and practices for risk management;
- promote participatory disaster risk governance;
- develop urban and climate resilience plans and programs that are integrated with urban development; and
- promote public and private investment in urban areas and their territories for the prevention and reduction of the risk of disasters and climate change, among others.

Based on the CRC Initiative experience, this list can be supplemented with some innovative recommendations for planning and urban design:

- Consider the existing interdependencies between water-energy-food within urban territorial planning and use scenarios to respond in advance to pressures and risks that are caused by climate change.
- Incorporate local experiences in an Urban Climate Resilience Plan, using multiple scales (individual, family, community, local governments).
- Ensure an understanding of the interaction of peri-urban and rural spaces to guarantee environmental services as a basis to build resilience.
- Consider the complexity of the causality of risk management mechanisms in order to address them in all their dimensions, including gender.
- Include productive systems, actions or mechanisms in urban design that promote pre-existing activities and local knowledge, encouraging the use of sustainable production, adaptation and consumption modalities.
- Grant incentives to the private sector by the State in the form of fiscal and credit instruments, and investment opportunities in sustainable projects that generate resilience and reduce vulnerability, promoting local climate-compatible development.

In this context, the CRC Initiative confirms that:

- The local scale is an essential scenario in which to put into practice solutions that converge with global agendas; and
- In order to respond to the uncertainty of climate change, cities must go from generating a single development plan to producing a battery of plans. Digital technologies facilitate the adoption of this type of approach.

Recognizing that urban resilience initiatives can help national governments achieve their goals

National governments have been set the challenge of implementing multiple international frameworks by 2030 and beyond, and have a difficult road ahead to meet their goals and targets. Some of these are directly related to urban development and resilience (SDG Goals 11 and 13) for example, as well as the New Urban Agenda, which is linked to the SDGs, and put cities center stage. But there are many other internationally defined and nationally determined goals that don't focus on implementation at the city level, except perhaps in reference to the millions of people living in mega and other major cities. Yet the SDGs can't be achieved without proper engagement of local and regional governments. The CRC Initiative demonstrates the potential of even poorly resourced sub-national governments and their partners to contribute to national commitments and global agendas.

By establishing horizontal governance arrangements (of the kind created in the Cooperación entre Ciudades Fronterizas project), exchanging information and sharing lessons between cities, these kinds of initiatives could be replicated else where. The impact of actions across hundreds of small and medium-sized cities in Latin America could be huge. Building climate resilience is ultimately a shared responsibility, and national governments would do well to both support and rely on small and medium-sized cities to contribute to finding and financing solutions.

APPENDIX



CRC project cards

Project: Climate-resilient Cumbaza: Towards Water, Energy and Food Security in Rural-Urban Landscapes

Objective: To identify current and future risks in water, energy and food security by applying the water-energy-food link approach, and designing actions and measures that improve the governance of natural resources in the Cumbaza River micro-basin.

Implementing partners	<ul style="list-style-type: none"> • Global Canopy • Centro de Desarrollo e Investigaciones de la Selva (CEDISA) • Centro de Competencias del Agua (CCA)
City and country	Tarapoto (Peru)
City context	<p>The city of Tarapoto is one of the municipalities most affected by droughts and heavy rains in the Peruvian Amazon region¹⁰. This is due to the lack of adequate planning that has led the city to develop in high-risk areas¹¹ such as the hillsides of the Cumbaza River. The river is constantly flooded when flow increases. In addition, its high environmental degradation affects the water services upon which urban and rural stakeholders in the micro-watershed depend. Between 1977 and 2005, forest cover in this area was reduced by 58% as a result of unsustainable agricultural practices, infrastructure development and urban growth (GIZ, 2016), generating a reduction in the availability and quality of water resources.</p>
Activities developed and achieved results	<p>The project carried out an analysis of the link between water, energy and food, which made it possible for the first time to visualize and account for the interdependencies between its systems. The project recognized the complex relationships and competition among economic sectors, the biophysical environment, natural ecosystems and social arrangements (governance at the local and regional levels), which affect decision-making processes in the face of a changing climate in the micro-basin of the Cumbaza River in Tarapoto.</p> <p>The project, in close collaboration with the regional and local government, private entities and civil society:</p> <ul style="list-style-type: none"> • evaluated the complex interdependencies and risks in the demand, availability and management of resources among sectors and stakeholders of Tarapoto in the Cumbaza River micro-basin, under different climate and development scenarios;

¹⁰ http://bvp.ad.indec.gov.pe/doc/estudios_CS/Region_San_Martin/san_martin/tarapoto_otros.pdf

¹¹ http://www.mpsm.gob.pe/architrans/EDICION_FINAL_PDU/RESUMEN_EJECUTIVO/Resumen_Ejecutivo.pdf

- promoted the development and adoption of consistent strategies, actions and measures at multiple scales (city, districts, provinces, basin) that can reinforce the integral management of resources and reduce vulnerability to climate change;
- expanded the participation and contribution to a mechanism based on the payment for water ecosystem services (MRSEH), to promote the funding of activities that favor resilient development to climate change. The key role played by forest ecosystem services to guarantee the resilience of the natural systems on which different sectors and urban-rural stakeholders of the micro-basin depend was demonstrated;
- trained and promoted knowledge regarding the concept of the water-energy-food link for integrated resource management and climate-resilient development, as a key factor to strengthen governance in the Cumbaza micro-basin; and
- generated technical instruments such as a Methodological Manual for the analysis of the water-energy-food link in Amazon basin, which will help to promote this approach and its replication in other basins of the region.

Project: A Participatory Decision-making Approach to Climate Resilience and Inclusive Urban Development in Latin America

Objective: To explore and promote planning options in a participatory manner for sustainable and climate-resilient urban development in the cities of Dosquebradas in Colombia, Santa Ana in El Salvador and Santo Tomé in Argentina.

Implementing partners	<ul style="list-style-type: none"> • Instituto Internacional de Medio Ambiente y Desarrollo (IIED – América Latina) • Center for Urban Disaster Risk Reduction and Resilience (CUDRR+R) • Alterra, Stichting DLO
City and country	Dosquebradas (Colombia), Santa Ana (El Salvador), Santo Tomé (Argentina)
City context	<p>The city of Dosquebradas in Colombia is highly vulnerable to risks of flooding, avalanches, landslides and droughts associated with the climate variability of the Andean zone where it is located. These climate risks may change in their intensity and nature in the coming decades, given the initial effects of climate change.</p> <p>The city of Santa Ana in El Salvador is vulnerable to multiple risks associated with seismic activity, volcanic eruptions, drought, heatwaves, and rainwater floods, among others. Projections on the impact of climate change indicate an increase in the number and severity of hydro-meteorological risks, with flash floods being the greatest risk due to their rapid increase in recent years (BID, 2012).</p> <p>The city of Santo Tomé in Argentina is strongly affected by the flood regime of the Salado River and intense rains. The flow of water to be evacuated exceeds the capacity of the pumps and some reservoirs. In addition, the high water table levels in several areas of the city create an obstacle to drainage and traffic flow. Climate forecasts for the region estimate an increase in the frequency and intensity of extreme hydro-climatic phenomena in this city.</p>

**Activities
developed
and achieved
results**

The project supported a participatory planning process to promote an inclusive and climate resilient urban development through the application of a multi-stakeholder and participatory methodology, making use of Quicksan¹² to facilitate discussions and support decision making. The project carried out the following actions:

1. Mapping of stakeholders, key interviews and information analysis
2. Participatory planning workshops using Quicksan
3. Systematization and preparation of a portfolio of actions for each city
4. Validation and presentation to decision makers
5. Joint reflection and exchange between cities

A key element was to work based on the results of previous territorial planning processes. During the project, workshops were held to build capacities (internal and external). In addition, the cities joined or renewed their commitment to the Making Cities Resilient Campaign: My City is Getting Ready (United Nations Office for Disaster Risk Reduction – UNISDR).

"Trustworthy" coordination and discussion spaces were developed, where portfolios of action options were drawn up for each city. These portfolios integrated strategies for disaster risk reduction, adaptation to climate change and resilient urban development. They also focused on reducing inequality and increasing empowerment through a participatory process.

The purpose was to influence planning and decision-making methods around urban development. These portfolios of action options can serve as a road map to strengthen the resilience work in each city.

They include a series of feasible actions to be implemented, which promote the strengthening of climate resilience in an uncertain context. The inclusion of sectors, areas and environmental services and the integration of disaster risk reduction, mitigation and adaptation in urban planning, has the ultimate goal of improving municipal inter-institutional coordination with local stakeholders and strengthening local governance.

¹² Quicksan is a practical, open, innovative, flexible and participatory methodology and tool that facilitated the integration of information and diverse knowledge in these three cities with rapid urban growth.

Project: Livelihoods and Climate Change: The Effects of Expansions-Contractions and Climate Disturbances

Objective: To collect and analyze socio-economic and climate information to promote planning and practices that guide the resilience to floods caused by hydro-climatic disturbances in the cities of the Amazon Delta.

Implementing partners	<ul style="list-style-type: none"> • Universidade Federal do Pará(UFPA –Belém,Brazil) • Fundação de Amparo e Desenvolvimento da Pesquisa(FADESP–Brazil) • Universidade do Vale do Paraíba(UNIVAP– São José dos Campos,Brazil) • The International Research Institute for Climate and Society (IRI) • Earth Institute, Columbia University, USA • Universidade do Estado do Amapá (UEAP – Brazil) • Governo do Estado do Pará (Brazil)
City and country	Cities of the Amazon Delta: Abaetetuba (Brazil), Ponta de Pedras (Brazil), Santana (Brazil), Mazagón (Brazil)
City context	<p>The Amazon Delta is one of the regions most affected by the rise in sea level and other hydro-climatic alterations that cause erosion and flood events, with socio-economic impacts for the municipalities near the coast of Amapá and Pará. In the last four decades, these four cities, located in the Amazon Estuary, have been at the epicenter of socio-spatial and environmental transformations in this region because they have doubled and even quadrupled their population. Much of the low-income population in these cities lives in neighborhoods prone to flooding caused by unplanned rapid occupation and changes in local rainfall, river level and sea level in the estuary.</p>
Activities developed and achieved results	<p>In order to inform policy-maker decisions and, within the framework of its research component, the project compiled and analyzed socio-economic and climate information by preparing a conceptual framework. The aim was to analyze the problems of vulnerability to hydro-climatic disturbances in the cities of the Amazon Delta and apply a vulnerability index to this data. Based on this, the project carried out the following actions:</p>

1. The generation of information and materials based on the research results (distributed to residents of vulnerable areas in Abaetetuba and Ponta de Pedras) as well as reports for policies and a Resilience Manual to help decision makers in those cities.
2. The installation and use of rainwater harvesting prototypes for families living in vulnerable areas in the cities of Abaetetuba and Ponta de Pedras (with great potential for replication).
3. The creation of the AquiAlaga mobile application to warn the population about floods and risk management. Collaboration with the Amazon Protection System (SIPAM). The improvement of the application and its integration into the Natural Disaster Prevention and Warning System of the Ministry of Defense.
4. Advocacy for the inclusion of the climate change variable in legislation, during training meetings with the State Secretariat that supports the Counties in the State of Pará.

Project: Urban Triangular Cooperation: Building Resilient Development in the Triple Border of the Paraná Basin

Objective: To strengthen cooperation among the three border cities to reduce climate-related impacts, seek solutions to increase climate resilience, and provide evidence on the co-benefits of improving cooperation among cities to achieve climate-resilient development in cross-border contexts.

Implementing partners	<ul style="list-style-type: none"> • University of Leeds (England) • PoloiguassuInstituto para Desenvolvimento da Regiao Trinacional (Brazil) • Dirección de Meteorología e Hidrología de la República de Paraguay • Universidad Católica Nuestra Señora de la Asunción (Paraguay) • Universidad Nacional de Asunción (Paraguay) • Escuela Forestal de la Universidad Nacional de Misiones (Argentina)
City and country	Foz do Iguaçu (Brazil), Puerto Iguazu (Argentina), Ciudad del Este (Paraguay)
City context	<p>Ciudad del Este, Puerto Iguazú and Foz do Iguaçu face common challenges related to climate change - three cities, three countries, a common challenge -. Sharing borders at the confluence of the Paraná and Iguazú Rivers, these cities are irrigated by several streams. Due to its location and proximity to rivers, the region is highly exposed to the risk of flooding. In recent years, these cities have suffered numerous impacts from extreme weather events such as floods, hail storms, strong winds and heatwaves, aggravated by El Niño. According to project estimates, from 2013 to 2017, the cost of associated damages was at least US\$ 40 million.</p>
Activities developed and achieved results	<p>The project responded to the need to integrate cross-border cooperation into climate change adaptation strategies and proposed to promote cross-border, city-city cooperation, as efforts and resources could be grouped together, providing more efficient results. Thus, bottom-up solutions were built that were profitable and inclusive.</p> <p>As a starting point, and through participatory research, the project conducted a vulnerability study that considered quantitative and qualitative indicators for the construction of an Urban Vulnerability Index. This study included the analysis of past trends and future projections that pointed to the urgency of increasing the resilience of the Triple Border Region.</p>

The project collected participatory ideas to reduce climate-associated risks and provided evidence of concrete projects to increase the resilience of cities, as well as the benefits of working together.

Based on this, the project managed to get the three cities commit to building climate-resilient, shared development through the implementation of the following initiatives:

1. The inclusion of the three cities in the "Making Cities Resilient" campaign, organized by the UNISDR.
2. The creation of the first Development Council for the Trinational Region of Iguazú.
3. The creation of the Trinational Network of Climate Sciences.
4. The development of 54 solutions that seek to increase the resilience of cities, classified as: green infrastructure and infiltration measures; prevention and response measures; efficiency measures and cooperation measures.

Project: CASA: Amazon Self-Sustainable Cities: Generating Homes

Objective: To propose constructive, architectural and urban design guidelines and develop prototypes that promote the value and use of local resources and knowledge to achieve sustainable cities and public spaces that are climate resilient.

Implementing partners	<ul style="list-style-type: none"> • Centro de Investigación de la Arquitectura y la Ciudad(CIAC) – Pontificia Universidad Católica del Perú (PUCP – Peru) • Instituto de Ciencias de la Naturaleza (INTE) – Territorio y Energías Renovables (PUCP–Peru) • Bartlett Development Planning Unit (DPU) – University College London (UCL– England)
City and country	Iquitos (Peru)
City context	<p>Floods are one of the most serious climate change problems in the region. Risks include: the overflow of rivers, heavy rains and the activation of gullies and landslides, to name a few. Each year, the Itaya River rises to dangerous levels, posing significant risk to the surrounding population, with the number of victims increasing annually.</p> <p>During the floods in 2017, more than 23 people lost their lives according to information from the National Institute of Civil Defense (INDECI, 2017). In this context, the Ministry of Housing of Peru is implementing a resettlement process from Belén to Nueva Ciudad de Belén.</p>
Activities developed and achieved results	<p>CASA focused on analyzing this resettlement process as a new form of coexistence between citizens, the city and the territory. The project assessed the importance of local knowledge in articulating urban processes as a mechanism to achieve resilience. It sought to highlight socio-economic and cultural realities that are often invisible.</p> <p>From a socio-ecological understanding of resilience, the project undertook a social analysis to identify the potentialities of the population, which enabled the application of a participatory research-action methodology, based on community organization.</p>

The appropriation of knowledge was achieved through participatory spaces of co-creation of livelihood systems. This was linked with urban design, from which seed prototypes were produced. These generated evidence of the positive impacts of implementing the project in the entire system in the long term through appropriate technologies based on the demand and needs identified in the community.

As a result, different community prototypes were designed in order to help the population face the effects of climate change, such as high temperatures and lack of water.

These environmentally-friendly prototypes were built entirely with local materials, optimizing resources. In addition, booklets and urban design guides were generated that provided guidelines and recommendations to promote more sustainable and climate-resilient resettlement processes.

Project: Climate Resilient Coyuca: Building Gender-Sensitive Urban Governance in the Coastal Lagoon System

Objective: To develop a climate adaptation strategy for the coastal lagoon system of Coyuca de Benítez, working with a multi-stakeholder platform, and incorporating the gender perspective.

Implementing partners	<ul style="list-style-type: none"> • Tecnosistemas y Peaje, S.A. de C.V. (Tecnopeaje) • Universidad Autónoma de Guerrero (UAGRO – Mexico) • University College London (UCL – England) • Instituto de Tecnología de Acapulco (Mexico) • Prabha Khosla Consulting • Indian Institute for Human Settlements
City and country	Coyuca de Benítez (Mexico)
City context	<p>The Urban Coastal Lagoon System (SULC) of Coyuca is located south of the municipality of Coyuca de Benítez. Eighteen localities, including the municipal administrative center, make up the SULC, which has grown in close relationship with the Coyuca Lagoon, fed by the Coyuca, Las Cruces and Conchero Rivers.</p> <p>The territory is a rural-urban hybrid. It has rural characteristics of low population density and economic activities such as agriculture, fishing and livestock farming. It has urban features, given its location and functional relationship with the city of Acapulco. In the SULC, floods are the main risk associated with climate change. These are expected to increase in intensity and frequency in the coming years.</p>
Activities developed and achieved results	<p>The project developed a gender-sensitive, climate-change adaptation strategy for the SULC, with the aim of promoting participatory and inclusive urban governance patterns that facilitate the development of climate resilience in coastal cities.</p> <p>The project focused on:</p> <ol style="list-style-type: none"> 1. Analyzing the risks and vulnerabilities associated with climate change in the SULC. 2. Analyzing the governance patterns of the urban policies of the SULC, linked to the main climate risk (floods).

3. Developing a climate-change adaptation strategy for the territory
During these three stages, the multi-stakeholder platform made up of men and women of the SULC made it possible to enrich and share the research process and its results.

The main achievements of the project were:

1. The production of knowledge about the SULC and the Metropolitan Area of Acapulco in terms of gender inequalities, urban development, disaster risks and climate change.
2. The generation of more horizontal spaces for dialogue and exchange between stakeholders of various sectors and disciplines, related to the future of the SULC and the Metropolitan Area of Acapulco.
3. Capacity development of different stakeholders, in particular local professionals enrolled in the Management for Sustainable Development master's programs from Universidad Autónoma de Guerrero.

List of CRC products

All products in this list are available at: www.crclatam.net

Policy briefs

CASA

1. Desmaison, B. (2018). Hacia una gobernanza inclusiva: El reasentamiento poblacional como proyecto de desarrollo socio-económico sostenible. Informe para políticas. CRC Initiative.
2. Vásquez Baca, U. (2018). Tecnologías apropiadas y métodos de Subsistencia. Informe para políticas. CRC Initiative.
3. Castañeda Cheka, K. (2018). El proyecto de reasentamiento Nuevo Belén: Promoción de la gestión comunitaria. Informe para políticas. CRC Initiative.

Cooperación entre Ciudades Fronterizas

4. Sakai, P. (2017). Reduciendo la vulnerabilidad climática de la región triangular urbana. Informe para políticas. Iniciativa CRC.
5. Sakai, P. (2018). Estrategias de cooperación: La solución para aumentar la resiliencia de la Triple Frontera ante el cambio climático. Informe para políticas. CRC Initiative.

Coyuca Resiliente al Clima

6. De la Parra, A.M. (2018). Coyuca resiliente al clima: Adaptación al cambio climático en forma participativa y sensible al género. Informe para políticas. CRC Initiative.

Cumbaza Resiliente al Clima

7. Sabogal, D., Carlos, G., Del Castillo, M. & Willems, B. (2018). Hacia la resiliencia hídrica en paisajes urbano-amazónicos: Estrategias para Tarapoto y la microcuenca del Río Cumbaza (Perú). Informe para políticas. CRC Initiative.

Medios de Vida y Cambio Climático (These policy briefs are also available in Portuguese)

8. Pinedo-Vázquez, M., Ming Lee, T., Thomas, S., DeAlmeida, O. T., De Medeiros Ribeiro, S. L., Furtado Oliveira, C. & Rabelo, F. (2018). Planificación urbana: Yendo más allá de la asistencia al desastre. Informe para políticas. CRC Initiative.
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10. Pinedo-Vazquez, M., Ming Lee, T., De Almeida, O. T., Medeiros Ribeiro, S. L., Furtado Oliveira, C., Leite, M., Abreu, A., Thomas. S. & De Lima, A. C. B. (2018). Comunicar e informar anomalías y riesgos climáticos para aumentar la resiliencia urbana en el Delta Amazónico. Informe para políticas. CRC Initiative.

11. De Almeida, O. T. & Piva da Silva, M. (2018). Ciudadanía y poder público local: Estrategias para reducir la vulnerabilidad mediante soluciones a los problemas de vivienda e infraestructura urbana. Informe para políticas. CRC Initiative.
12. Pinedo-Vasquez, M., Ming Lee, T., De Lima, A. C. B., Furtado Oliveira, C., Leite, M., Abreu, A., Rabelo, F., De Almeida, O. T. & De Medeiros Ribeiro, S. L. (2018). Desafíos de la salud frente al cambio climático en las Pequeñas Ciudades Amazónicas. Informe para políticas. CRC Initiative.
13. De Lima, A. C. B. & De Almeida, O. T. (2018). El acceso al agua en áreas urbanas de várzea: investigación aplicada para políticas públicas. Informe para políticas. CRC Initiative.
14. De Lima, A. C. B., De Almeida, O. T., Furtado Oliveira, C. & Mercado, J. (2018). Dos ejemplos de estrategias de resiliencia para asentamientos en riesgo en ciudades de la Amazonia. Informe para políticas. CRC Initiative.

Planeamiento Participativo

15. Hardoy, J., Winograd, M., Gencer, E., Van Eupen, M., Montoya, Y., Olivo, I., Padilla, C., Ramírez, N., Saenz Valiente, D. & Wolansky, S. (2018). Planificación participativa para la resiliencia climática en ciudades de América Latina. Informe para políticas. CRC Initiative.
16. Winograd, M., Montoya, Y., Ramirez, N., Van Eupen, M. & Pacha, M. J. (Ed.). (2018). Planeamiento participativo e implementación de acciones para la resiliencia al clima: el caso de Dosquebradas (Colombia). Informe para políticas. CRC Initiative.
17. Gencer, E., Padilla, C. & Pacha, M. J. (Ed.). (2018). Planeamiento participativo e implementación de acciones para la resiliencia al clima: El caso de Santa Ana (El Salvador). Informe para políticas. CRC Initiative.
18. Hardoy, J., Saenz Valiente, D. & Pacha, M. J. (Ed.). (2018). Planeamiento participativo e implementación de acciones para la resiliencia al clima: El caso de Santo Tomé (Argentina). Informe para políticas. CRC Initiative.

Reports

1. Becerril, H. & De la Parra, A. (2018). Coyoaca resiliente al clima: Estrategia de resiliencia al cambio climático. CRC, CDKN, FFLA, IDRC.
2. López, R. & Palacios, R. (2017). Diagnóstico de riesgos climáticos del sistema urbano lagunar de Coyoaca (Informe1). Proyecto Coyoaca Resiliente al Clima de la Iniciativa Ciudades Resilientes al Clima en América Latina. CRC, CDKN, FFLA, IDRC.
3. Sabogal, D., Carlos, G., Del Castillo, M., Willems, B., Bleeker, S., Meza, F., Bellfield, H., Rengifo, C. & Peñaherrera, T. (2018). Manual metodológico para el análisis del nexo agua-energía-alimentos en cuencas Amazónicas. Global Canopy, CEDISA, CCA.
4. Sabogal, D., Carlos, G., Del Castillo, M., Willems, B., Bleeker, S., Bellfield, H. & Meza, F. (2018). Strengthening climate resilience in urban Amazonia: Experiences from Tarapoto and the Cumbaza Watershed in San Martín, Peru. Global Canopy, CEDISA, CCA.
5. Sakai, P., Sakai, M., Schneider, T., Oberling, D. F., Oreggioni, F., López, L., Franzini, A. C., Aquino, C., Tischner, A., Caballero, N. & Penagos, J. (2017). Vulnerability assessment and adaptation strategies of the Triangle-City region. CRC, CDKN, IDRC.
6. Sakai, P., Sakai, M., Aquino, C., Oreggioni, F., Franzini, A. C., Schneider, T., Tischner, A., López, L., Bardelás, A. & Caballero, N. (2018). Construyendo desarrollo resiliente al clima en la Triple Frontera. CRC, CDKN, IDRC, FFLA.

Books

1. Desmaison, B., Astolfo, G., Boano, C., Canziani, J., Castañeda, K., Espinoza, K., Gamio, P., Laurie, A., Moschella, P., Mujica, L., Vásquez, U. & Vega-Centeno, P. (2018). CASA: Ciudades auto-sostenibles Amazónicas. Pontificia Universidad Católica del Perú, CRC Initiative. En: <http://casapucp.com/publicaciones/libro/>
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3. Pereira, L. C. & De Almeida, O. T. (2018). Mudanças climáticas em pequenas cidades do Delta e Estuário Amazônicos: Caminhos para a resiliência climática. Belem: NAEA, UFPA. En: <http://www.naea.ufpa.br/naea/novosite/index.php?action=Publicacao.arquivo&id=644>

Book chapters

1. Pereira, L. C., De Almeida, O. T. & Nina, A. (2018). Gestão municipal de risco nas pequenas cidades. In: Mudanças climáticas em pequenas cidades do Delta e Estuário Amazônicos: Caminhos para a resiliência climática. L. Pereira & O. T. de Almeida. Belem: NAEA, UFPA, pp. 83–90.

2. Pinedo, M., De Almeida, O. T., De Medeiros Ribeiro, S. L., Pereira, L. & Furtado, C. (2018). Contextualização das pequenas cidades do Delta e Estuário Amazônicos. In: Mudanças climáticas em pequenas cidades do Delta e Estuário Amazônicos: Caminhos para a resiliência climática. L. Pereira & O. T. de Almeida. Belem: NAEA, UFPA, pp. 15–29.
3. Pinedo-Vasquez, M., Ming Lee, T., De Almeida, O. T., Pereira, L., De Lima, A. C. B., De Medeiros Ribeiro, S. L., Nina, A. & Thomas, S. (2018). Análise de vulnerabilidade das pequenas cidades. In: Mudanças climáticas em pequenas cidades do Delta e Estuário Amazônicos: Caminhos para a resiliência climática. L. Pereira & O. T. de Almeida. Belem: NAEA, UFPA, pp. 43–83.
4. Pinedo-Vasquez, M., Ming Lee, T., De Lima, A. C. B., De Almeida, O. T., De Medeiros Ribeiro, S. L., Pereira, L., Piva da Silva, M. & Rabelo F. (2018). Mudanças climáticas na Região Delta-Estuarina. In: Mudanças climáticas em pequenas cidades do Delta e Estuário Amazônicos: Caminhos para a resiliência climática. L. Pereira & O. T. de Almeida. Belem: NAEA, UFPA, pp. 35–43.

Guides about prototypes

CASA (Available at: www.casapucp.org)

- Improved kitchen
- Rain water collection system
- Improved windows

Academic articles

1. Environment and Urbanization Journal, volume No. 88: "Strengthening climate resilience in Latin America cities", with the following articles:

1. Pacha, M.J. & Villamarín, G., (2018). Resiliencia urbana en ciudades intermedias de América Latina. *Revista Medio Ambiente y Urbanización* 88 (1):11–28.
2. Hardoy, J., Gencer, E. & Winograd, M. (2018). Planificación participativa para la resiliencia al clima en ciudades de América Latina: Los casos de Dosquebradas (Colombia), Santa Ana (El Salvador), y Santo Tomé (Argentina). *Revista Medio Ambiente y Urbanización* 88 (1): 29–61.
3. Sakai, P., Caballero, N., Sakai, M., Aquino, C., Oreggioni, F., Lopez, L., Oberling, D., Scheneider, T., Franzini, A. & Tischner, A. (2018). Vulnerabilidad climática de Puerto Iguazú, Argentina: Camino a la adaptación. *Revista Medio Ambiente y Urbanización* 88 (1): 63–94.
4. De Almeida, O. T., De Lima, A.C.B., Pinedo-Vasquez, M., Ming Lee, T., De Medeiros Ribeiro, S. L. & Mansur, A. (2018). Resiliencia urbana y Amenazas Climáticas: Vulnerabilidad y planificación de adaptación para ciudades pequeñas en el Delta y Estuario del Río Amazonas. *Revista Medio Ambiente y Urbanización* 88(1):95–122.
5. Sabogal, D., Carlos, G. & Willems, B. (2018). El nexo agua-energía-alimentos en paisajes urbano-Amazónicos: un estudio de caso de Tarapoto y la microcuenca del Río Cumbaza, Perú. *Revista Medio Ambiente y Urbanización* 88 (1): 123–148.

6. Desmaison, B., Boano, C. & Astolfo, G. (2018). CASA [Ciudades Auto-Sostenibles Amazónicas]: Desafíos y oportunidades para la sostenibilidad de los proyectos de reasentamiento poblacional preventivo en la Amazonía Peruana. *Revista Medio Ambiente y Urbanización* 88 (1):149–176.
7. Velasco, R. L., Torres, G. & De la Parra, A. M. (2018). Adaptación de activos al cambio climático en el Sistema Urbano Lagunar de Coyuca, México: Hacia la resiliencia climática en ciudades costeras. *Revista Medio Ambiente y Urbanización* 88 (1):177–198.
8. Vásquez, A., De la Parra Roveló, A.M., Castañeda Checa, K., Del Castillo, M., De Lima, A.C.B. & De Almeida, O. T. (2018). La perspectiva de género ¿Una consideración necesaria para comprender y transformar estructuras de desigualdad en el contexto del cambio climático? *Revista Medio Ambiente y Urbanización* 88 (1): 199–245.

2. Other academic articles

9. Desmaison, B., Vásquez, U. & Espinoza, K. (2018). Medios de vida, tecnologías apropiadas y su integración con los planes de desarrollo urbano: El caso de la Nueva Ciudad de Belén, Loreto, Perú. *Revista Espacio y Desarrollo* 31(1):171–193.
10. Hardoy, J., Gencer, E. & Winograd, M. (2019). Participatory planning for climate resilient and inclusive urban development in Dosquebradas, Santa Ana and Santa Tomé. *Environment and Urbanization*. Available at: <https://journals.sagepub.com/doi/10.1177/0956247819825539>
11. Sakai, P., Oberling, D., Schneider, T., López, L., Caballero, N., Oreggioni, F., Sakai, M., Tischner, A., Aquino, C., Franzini, A. & Coronel, G. (2017). Climate change adaptation in Ciudad del Este: Starting-point vulnerability assessment. *Paraquaria Natural* 5(2): 19–31.
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Research Reports

1. Almedia, O., de Lima, A.C.B., Rivero, S., Pinedo-Vásquez, M. y Pacha, M.J. (Ed) (2019). Medios de subsistencia y resiliencia al clima: efectos de expansión y contracción económica y perturbaciones climáticas en el modo de vida en ciudades del Delta Amazónico. *Iniciativa Ciudades Resilientes al Clima. Reporte de Investigación*. FFLA, CDKN, IDRC.
2. Becerril, H., De la Parra, A., López Velasco, R., Pacha, M.J. (Ed) (2019). Coyuca Resiliente al Clima. *Iniciativa Ciudades Resilientes al Clima. Reporte de Investigación*. FFLA, CDKN, IDRC.
3. Desmaison, B., Espinosa, K., Castañeda, K., Vásquez, U. y Pacha, MJ (Ed) (2019). “CASA [Ciudades Auto-Sostenibles Amazónicas]: generando hogares”. *Iniciativa Ciudades Resilientes al Clima. Reporte de Investigación*. FFLA, CDKN, IDRC.

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6. Sakai, P., Sakai, M., y Pacha, M.J (Ed) (2019). Cooperación triangular urbana: Construyendo desarrollo resiliente al clima en la cuenca del Paraná. Iniciativa Ciudades Resilientes al Clima. Reporte de Investigación. FFLA, CDKN, IDRC.

Infographics

1. Hacia la seguridad hídrica, energética y alimentaria en paisajes urbano-rurales amazónicos.
2. Hacia el desarrollo resiliente en la microcuenca del Río Cumbaza en Perú.

Videos

CASA – Presentando el contexto <https://youtu.be/YErIQavn-N4>

CASA – Objetivos y Proceso de CASA <https://youtu.be/Lz3bo6IAwqo>

CASA – Resultados de CASA <https://youtu.be/UtZidemtJNE>

CASA – Resumen de la experiencia CASA <https://youtu.be/UtZidemtJNE>

Web sites of the projects

CASA: <http://casapucp.com/>

Coyuca Resiliente al Clima: www.coyucaclima.com

About the Climate Resilient Cities Initiative in Latin America (CRC)

This is a joint initiative between the Climate and Development Knowledge Network (CDKN), the International Development Research Center (IDRC) and Fundación Futuro Latinoamericano (FFLA). The CRC Initiative financed six innovative research projects for decision-making and action in 13 small and medium-sized cities in Latin America to promote climate-resilient urban development.

About the Climate and Development Knowledge Network (CDKN)

CDKN helps decision-makers in developing countries to design and deliver climate compatible development. CDKN does this by combining research, advisory services and knowledge management in support of the political processes worked out and managed at the local level. CDKN works in partnership with decision-makers in the public, private and non-governmental sectors at different scales.

About the International Development Research Center (IDRC)

IDRC invests in knowledge, innovation, and solutions to improve the living conditions of people in the developing world. By bringing together the right partners around impact opportunities, IDRC helps shape the leaders of today and tomorrow and drives change for those who need it most. The climate change program aims to support research, alliances and networks that inform the adoption of cost-effective solutions to extreme climate events and climate change, and that generate long-term social and economic gains.

About Fundación Futuro Latinoamericano (FFLA)

FFLA is a member and Regional Coordinator of CDKN for Latin America and the Caribbean. The work of FFLA focuses on the promotion of constructive dialogue, and the strengthening of citizen, political and institutional capacities. It works on aspects of importance for sustainable development, including the management of natural resources, socio-environmental conflicts, and climate change. FFLA also provides training, facilitation and advisory services in related areas.



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International Development Research Centre
Centre de recherches pour le développement international



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